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ABSTRACT

This document is Volume I of a two-part course designed to improve mathematical proficiency and understanding as the student is given practice in relevant problem-solving situations. It includes the mathematics skills needed to make sound consumer decisions. The purpose of this course is to review, reinforce and extend concepts learned in the Fundamentals of Mathematics course. The focus of this course is on solving consumer-related problems. The use of a calculator is highly encouraged to allow the student to concentrate on the concept, rather than on computation. This curriculum guide is based upon the Scope and Content for Consumer Mathematics of the New York City Board of Education. It consists of plans for lessons, which should be considered suggestions rather than prescriptions. Each of the plans includes a developmental approach to a topic with a stress on problem-solving. Suggested questions are given to encourage student thinking and involvement in the lesson. The problems presented in the plans are designed to be relevant to students' experiences. The application problems provided with each plan may serve as a resource for teachers so that they may select appropriate problems for their individual classes. (Author/PK)

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CONSUMER MATHEMATICS • Vol. I

New York City Board of Education
Division of Curriculum and Instruction
Office of Curriculum Development and Support

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FOREWORD

The Consumer Mathematics Course provides New York City students with an option to meet the New York State Regents Action Plan requirement for a second year of mathematics credit for a local diploma. It is a course which integrates the computer with the teaching of consumer topics. Its purpose is to review and extend the topics from Fundamentals of Mathematics in the context of problem solving. It is hoped that students who complete this course successfully may then continue to take Sequential Mathematics, Course I. Since the applications chosen in the lessons are from real-life experiences, students are provided with a concrete base for learning mathematics.

It is hoped that the integration of the computer will serve as a motivating tool as well as providing students with knowledge of the electronic spreadsheet. The spreadsheet is an integral part of many occupations and thus has many practical purposes.

Each lesson in Consumer Mathematics begins with a clearly stated aim presented in question form. Performance objectives follow; these provide a focus for the teacher. The new vocabulary for the lesson is presented. This is followed by a motivational activity. A full development is presented, with suggested pivotal questions. Applications, solutions to applications and a summary are also included. In each lesson, opportunities have been provided to help students become better problem solvers as well as better consumers. The computer application lessons also include suggestions for lab sessions, homework assignments and homework solutions. A teacher's guide for both Appleworks and VisiCalc have been included to provide guidance to teachers for using particular commands, techniques and functions related to the electronic spreadsheet.

The Consumer Mathematics Course has been designed to anticipate students' needs for making consumer decisions in an increasingly technologically-oriented society. We anticipate that the Consumer Mathematics course will serve the individual needs of your students and enable them to acquire the mathematics skills they need in the present and for the future.

Charlotte Frank

Charlotte Frank
Executive Director
Division of Curriculum and Instruction

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Consumer Mathematics was developed for teachers as a project of the Mathematics Unit of the Division of Curriculum and Instruction, Charlotte Frank, Executive Director.

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INTRODUCTION

Consumer Mathematics (Volume I and Volume II) is a course designed to improve mathematical proficiency and understanding as the student is given practice in relevant problem-solving situations. It includes the mathematics skills needed to make sound consumer decisions. The purpose of this course is to review, reinforce and extend concepts learned in the Fundamentals of Mathematics course. The focus of this course is on solving consumer-related problems. The use of a calculator is highly encouraged to allow the student to concentrate on the concept, rather than on computation.

Volume II of Consumer Mathematics contains computer applications for many of the topics contained in Volume I. The lessons involve using Electronic Spreadsheets and applying them to real-life situations. The electronic spreadsheet can be used for teaching problem solving as well as for the study and implementation of algorithms. Teachers may choose to integrate these lessons into the corresponding units from Volume I or they may choose to teach the lessons from Volume II after completing Volume I. This will enable the students to review the topics from Volume I through the computer applications from Volume II.

This curriculum guide is based upon the Scope and Content for Consumer Mathematics. It consists of plans for lessons, which should be considered suggestions rather than prescriptions. The units may be taken in various sequences. This enables schools to make selections of the units to be included for their course based upon their individual population and needs. Each of the plans includes a developmental approach to a topic with a stress on problem-solving. Suggested questions are given to encourage student thinking and involvement in the lesson. The problems presented in the plans are designed to be relevant to students' experiences. The application problems provided with each plan may serve as a resource for teachers so that they may select appropriate problems for their individual classes. Solutions to application problems are given so that teachers may quickly determine students' errors.

It is recommended that basic skills be reviewed cyclically in homework assignments so that the students have the necessary pre-requisite skills needed for each lesson and so that the main focus of the course may be on problem-solving through consumer applications.

CONSUMER MATHEMATICS

VOLUME I

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CONSUMER MATHEMATICS

CALCULATORS

LESSON: 1

AIM: How do we perform the four basic operations on a hand-held calculator.

PERFORMANCE OBJECTIVES: The student will be able to...

1. Use a hand-held calculator to solve simple problems involving addition, subtraction, multiplication and division.
2. Predict the output when a simple calculation example is given.
3. Predict the output when a calculation example involving decimals is given.

* Note to teachers: Where possible, students should be using the same type of calculator. Also check that the calculator in use are algebraic, i.e., the order of operations is the one used in algebra. (Calculators yielding 28 for 6+8x2 should NOT be used - except maybe for demonstration purposes later on.)

VOCABULARY: calculator, input, output, operation, sub-total

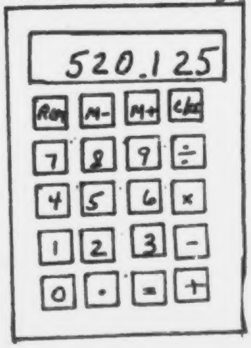
MOTIVATION:

1. Ask, "Can you explain why calculators were invented?" (Elicit, "In order to make complicated calculations much easier.")
2. Tell the class that today they will be learning how to use a "hand-held" calculator.

DEVELOPMENT:

1. Tell the class the name(s) and model(s) of the calculator(s) they will use.

2. Distribute a rexographed diagram of the calculator to be used. (One such diagram is seen on the left.) Distribute the calculator assigning students the responsibility of helping with the distribution so there is no loss.



3. Let us try a simple example for our calculator:

   EXAMPLE: Multiply 301 x 25

   Step 1: Enter $\boxed{3}\boxed{0}\boxed{1}$ on the keyboard (We use the word "INPUT" to describe the entering of a number.)

   Step 2: Enter the operation $\boxed{x}$ key.

   Step 3: Input the second number $\boxed{2}\boxed{5}$.

   Step 4: To tell the machine that we are finished with the second number, we press the $\boxed{=}$ key. The answer ("output") is seen INSTANTLY on the screen.

4. Ask, "Without using your calculator, can you predict the output for $\boxed{1}\boxed{7}\boxed{5}\div\boxed{2}\boxed{5}$?" (7) Have student check their predictions by performing the operation.

5. Do applications A# 1-4. Check that students are placing the decimals correctly. (You may need to modify this assignment according to the needs of your students.)

6. Often we need to add a list of numbers such as 63 + 581 + 983 + 201. Demonstrate how to do this example on a calculator. Note that after the $\boxed{6}\boxed{3}\boxed{+}\boxed{5}\boxed{8}\boxed{1}\boxed{+}$ keys are pressed, the number 644 shows on the display. Ask, "What does 644 have to do with this problem?" Introduce the term "sub-total" as the partial result when a set of calculations is to be done.

7. Do applications A# 5-8. Have students place their predictions on the board and let them explain what they did.

8. Do application B# 1-4. If your calculator has a "constant multiplication" feature, you may wish to show this in example 4.
9. If time permits have students quickly approximate each result in application B# 1 and 2.

APPLICATIONS:

A. Use your calculator to find the results of each calculation by:
   a) Predicting the answer BEFORE performing the calculation.
   b) Performing the correct sequence to do the calculation.
      1. 86 + 125
      2. $2016.21 - $18.43
      3. 12 x 57.1
      4. 125.1 ÷ 0.6
      5. 8.61 + 9.32 + 12.61
      6. 8.2 + 3.7 + 5.6 + 9.2
      7. 3.02 + 5.1 + 6.13 + 7.1
      8. 64.1 x 0.2

B. Use your calculator to find each of the following. First, carefully decide which keys must be pressed.
   1. $(37)^2$
   2. $(81)^3$
   3. $(6.2)^5$
   4. 612 is to be multiplied by each of the following:
      a) 6 b) 3.2 c) 5.1 d) 12.2
      Can you shorten the calculations?

SOLUTIONS TO APPLICATION PROBLEMS:

A) 1) 211
   2) $1997.78
   3) 685.2
   4) 208.5 (Be careful with the decimal placement here.)
   5) 30.54
   6) 26.7

7) 21.35 (Students must line up decimals carefully in this one.)

8) 12.82

B) 1) 1369
   2) 531441
   3) 9161.3283
   4) a) 3672
      b) 1958.4 (Review decimal placement in multiplication in here.)
      c) 3121.2
      d) 7466.4

SUMMARY:

1. Ask, "Why is it important that we know how to use calculators?"
2. Ask, "What step must we use each time we do a problem in order to tell the calculator to give us the answer?"

Be sure to collect calculators - delegating responsibility to a reliable student in each row!

CONSUMER MATHEMATICS

CALCULATORS

LESSON: 2

AIM: What is the meaning of the square root of a number? How do we find the square root of a number on a hand-held calculator?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Find the square root of a number (perfect squares only).
2. Use a hand-held calculator to square a given number.
3. Use a hand-held calculator to find the square root of a given number and round it to the nearest tenth.
4. Make a chart of squares and square roots for the integers from 1 through 20.

VOCABULARY: square, square root, perfect square

MOTIVATION:

1. Ask, "What do you get if you multiply 25 by itself?"
2. Ask, "What number, when used as a factor twice gives 25?
3. Ask, "How do the above questions differ?"

DEVELOPMENT:

1. The above leads to the following definitions which students should place in their notes:
   Definitions: 1. SQUARING a number means using a number as a factor twice. (Symbol: x^2)
   2. The SQUARE ROOT of a NUMBER x is **one** of two equal factors whose product is x. (Symbol: $\sqrt{x}$)
2. Do applications 1a-e, 2a-f.
3. Do applications 3 and 4. Elicit, "Performing these two new operations in succession always gives the number you start with."
4. Do application 5a, 5b, 5c.

5. Ask, "What is the square root of 2?" Discuss that since $(1)^2=1$, and $(2)^2=4$, $\sqrt{2}$ is between 1 and 2.

6. If your calculator has a square root key, distribute the calculators to your students. Have them use the calculator to find 7^2 (Some calculators have $\boxed{x^2}$ buttons. Most can find 7^2 by depressing $\boxed{7}\boxed{x}\boxed{=}$. Otherwise press 7 x 7 =.) Have the class find $\sqrt{49}$. Press $\boxed{49}\boxed{\sqrt{\ }}$ (Note the reverse order.) To find $\sqrt{2}$, press $\boxed{2}\boxed{\sqrt{\ }}$. The screen should show 1.4142135. Today we will round all square roots to the nearest tenth. Thus $\sqrt{2} \approx 1.4$. (If your calculators do not have a square root key, you may wish to teach how to estimate square root to the nearest tenth.)

7. Do applications 6a-f.

8. Have class complete the following chart using their calculators. (Have the headings prepared on a rexographed sheet ahead of time.)

Number	Square	Square Root
1		
2		
3		
4		
5		
6		
7		
8		
.		
.		
.		
20		

APPLICATIONS:

1. Find a) 6^2 b) 8^2 c) $(3.1)^2$
d) 7^2 e) 9^2

2. Find a) $\sqrt{64}$ b) $\sqrt{100}$ c) $\sqrt{0}$
d) $\sqrt{121}$ e) $\sqrt{144}$ f) $\sqrt{1}$

3. First square 15 then, find the square root of this result.

4. Find the square root of 400. Then square this result.

5. Find a) $\sqrt{\frac{1}{4}}$ b) $\sqrt{.01}$ c) $\sqrt{\frac{9}{16}}$

6. Use your calculator to find each square root to the nearest tenth:
   a) $\sqrt{11}$ b) $\sqrt{98}$ c) $\sqrt{150}$ d) $\sqrt{67}$
   e) $\sqrt{83}$ f) $\sqrt{86}$

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 36 b) 64 c) 9.61 d) 49
   e) 81

2. a) 8 b) 10 c) 0 d) 11
   e) 12 f) 1

3. 15

4. 400

5. a) $\frac{1}{2}$ b) .1 c) $\frac{3}{4}$

6. a) 3.3 b) 9.9 (Show rounding upward.)
   c) 12.2 d) 8.2 e) 9.1 f) 9.3

SUMMARY:

1. Ask, "What is the difference between the square and the square root of a number?"

2. Can you think of a number in which the square and square root are the same?

CONSUMER MATHEMATICS
CALCULATORS
LESSON: 3

AIM: How do we use a calculator to perform more complicated operations?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Do more complicated problems involving several operations on a calculator.
2. Use the memory of a calculator to store a denominator in order to then calculate the numerator of a more complicated problem.

VOCABULARY: numerator, denominator, sales tax

MOTIVATION:

Joe's Restaurant
6th Avenue At 23rd Street
Phone: 123-456

2 steak dinners	23.00
1 chicken dinner	10.50
3 colas	2.25
8% Tax	
Total	

Three friends ate dinner at Joe's Restaurant. Their waitress must fill out the bill. Can you finish the bill she has started (shown above)? You can use your calculator to help.

DEVELOPMENT:

1. This problem entails several stages.

STAGE 1: Total up the bill. sub-total = $35.75
STAGE 2: Find the Tax by multiplying by 8%.
Method 1: 35.75 x .08
Method 2: 35.75 x $\boxed{8}\boxed{\%}$ (Check if the calculator your class is using has a "%" key.)
Tax: $2.86

STAGE 3: Add the tax to the sub-total:
35.75 + 2.86 = $38.61

2. Ask, "If they add a $4.50 tip, what is the total cost of eating out?" ($43.11)

   Ask, "If they decide to split the cost equally, how much must each friend pay?" ($14.37)

   In the previous problem, there were several calculations needed to get the final answer. One way to keep partial answers is to use the memory key (usually denoted "M+"). In the previous problem, we could have used the memory to help us in the calculations by:

   a) Clearing the calculator to start (On some calculators, there is a "Clear Memory" key. On others turning the machine on or subtracting the memory from itself will do this.)
   b) Pressing $\boxed{2}\boxed{3}\boxed{.}\boxed{0}\boxed{0}\boxed{+}\boxed{1}\boxed{0}\boxed{.}\boxed{5}\boxed{0}\boxed{+}\boxed{2}\boxed{.}\boxed{2}\boxed{5}\boxed{=}$
      The subtotal (35.75) should appear in the screen.
   c) Pressing $\boxed{\text{M+}}$ to place this result in the memory.
   d) Pressing $\boxed{\times}\boxed{.}\boxed{0}\boxed{8}\boxed{=}$ or $\boxed{\times}\boxed{8}\boxed{\%}$ to get $2.86.
   e) Pressing $\boxed{+}\boxed{{}^{R}{}_{M}}$ = (This adds the results in memory to the tax.)
   f) Pressing $\boxed{+}\boxed{4}\boxed{.}\boxed{5}\boxed{0}\boxed{=}$ (The result 43.11 should appear on the screen.)
   g) Pressing $\boxed{\div}\boxed{3}\boxed{=}$ to get 14.37.

3. Do applications 1, 2 and 3.
   Do application 4.

4. In doing applications 5 and 6 students should first handle the denominator (Try ex. 6 both ways). Write on the board, "When doing a complicated calculation involving calculations in the denominator of a fraction, handle the **DENOMINATOR** first and then store it in memory before handling the numerator."

5. Do application 7.

APPLICATIONS:

1. Two people ate lunch together. Sales tax of 8% had to be

added to the cost of $24.50. If four dollars is to be added as a tip, find the amount each person had to pay.

2. Use your calculator to find $\frac{6.2\times3.5\times102}{4}$

3. Use your calculator to find $2^2+3^2+4^2$

4. Use your calculator to find $\frac{10^2+12^2+14^2}{4}$

5. Use your calculator to find $\frac{1000}{6^2+8^2+6^2+8^2}$

6. Use your calculator to find $\frac{512\times32}{16\times128}$

7. Use your calculator to find $\frac{3^2+4^2+25\times3}{2268\div36+3^3-4\times10}$

SOLUTIONS TO APPLICATION PROBLEMS:

1. Tax = 1.96   Total bill = 24.50+1.96+4.00 = $30.46
   Price each paid = 30.46/2 = $15.23

2. $\frac{2213.4}{4}$ = $553.35

3. Each partial result must be added to memory Answer is 29.

4. Numerator is found by using the memory
   Numerator is 440, Result is 110.

5. The key here is doing the denominator first and storing it (200) in memory. Result is 5.

6. $\frac{16384}{2048} = 8$ (First do denominator.)

7. $\frac{100}{50} = 2$ (First do denominator.)

SUMMARY:

1. Ask, "When do you use a calculator's memory?" (To hold a partial result.)

2. Ask, "What part of a complicated fraction do we calculate first on a calculator?" (The denominator.)

CONSUMER MATHEMATICS

CALCULATORS

LESSON: 4

AIM: How do we round off the results of a complicated computation found on a calculator?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Use their calculators to find the results of a complicated set of calculations.
2. Round their results to the nearest
   a) whole number b) tenth c) hundredth

VOCABULARY: Round off; nearest whole number, nearest tenth, nearest hundreth

MOTIVATION:

So far this term, Allan's marks are 70, 80 and 85. Use your calculator to find Allan's average.

DEVELOPMENT:

1. Recall: To find the average of 3 numbers we a) first add the 3 numbers then b) divide the sum by 3.
2. Thus Allan's average is $\frac{70+80+85}{3} = \frac{235}{3} = 78.333333$
3. Since Allan's marks are whole numbers, we may want to express his average as a whole number.
   Ask, "What are the two possible choices in this case?" (78 and 79)
   Ask, "Which of the two numbers should we choose to represent Allan's Average?"
   (78 since 78.333333 is closer to 78 than 79.)
4. When we shorten or approximate a number to make it easier to use, we say we are "rounding off the number." Here, we rounded 78.333333 to the nearest whole number.

5. Develop the following procedure and write it on the board

   ROUNDING TO ANY PLACE VALUE

   1) When rounding to a given place value, check the next digit to the RIGHT of that position.
   2) If the next digit is less than 5, we round down.
   3) If the next digit is 5 or more, we round up.

6. Example One

   Round 43572 to the nearest hundred.

   Solution: 5 is in the hundreds place.
   7 is the next digit to the right. Since 7 is 5 or more, we change the 5 to a 6 and round 43572 to 43600.

   Ask, "Can you invent a situation where you would want to use 43600 instead of 43572."

   One possible answer: There were 43572 people at Yankee Stadium. It's easier to remember 43600.

7. Example Two

   John's yearly salary is $25000. He gets paid monthly. How much should his check reflect each month?

   Ans: $\frac{25000}{12} = 2083.333$ We round this to the nearest cent (or hundredth) to $2083.33.

8. As consumers we often have problems where we must round off when purchasing items. Try applications 1 and 2 with your class.

9. Do applications 3-6. Have the students explain the correct placement of a decimal in the numerator or denominator of a calculation.

APPLICATIONS:

Use your calculator to perform each operation and round accordingly.

1) Four members of a club buy seven records together. Each record costs $9.99 (including tax). Find to the nearest cent how much each member must pay.

2) Five friends ate dinner out together and wish to split the cost equally. If together the meals cost \$89.75, the tax is 9 percent and they wish to leave a fifteen dollar tip, find the cost to each friend.

(3-7) For each of the following round to the nearest a) whole number b) tenth c) hundredth.

3) The average of 60, 80, 68, 70, 69, 77

4) $\frac{6.2 \times 3.1 \times 5.41}{7.1}$

5) $\frac{34.02 \times .001}{.02}$

6) $\frac{61.3 \times 45.7}{301.02 \times .0013}$

7) 69.9999

SOLUTIONS TO APPLICATION PROBLEMS:

1) $\frac{9.99 \times 7}{4} = \frac{69.93}{4} = 17.4825$ Ans. \$17.48 (one member will pay an additional cent.)

2) $(89.75) \times .09 = 8.0775$ This is rounded off to 8.08.

Total cost = 89.75 + 8.08 + 15 = 112.83

$\frac{112.83}{5} = 22.566$ This rounds to \$22.57.
(The extra 2¢ can go to the tip.)

3) The average of 60, 80, 68, 70, 69, 77.

Sum = 424

Average = $\frac{424}{6} = 70.666666$

a) 71 b) 70.7 c) 70.67

4. $\frac{103.9802}{7.1} = 14.645098$

a) 15 b) 14.6 c) 14.65

5) $\frac{.03402}{.02} = 1.701$

a) 2 b) 1.7 c) 1.70

6) $\frac{2801.41}{.391326} = 7158.7627$ (Remember to handle the denominator first.)

a) 7159 b) 7158.8 c) 7158.76

7a) 70 b) 70.0 c) 70.00

SUMMARY:

1. Ask, "How do we round a number off to hundredths?"
2. Ask, "Why do we ever want to round off a number?"
3. Do application 7.

CONSUMER MATHEMATICS
CALCULATORS
LESSON: 5

AIM: How do we estimate the results of a computation problem?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Approximate the results of a complicated calculation.
2. Perform the calculations on a calculator.
3. Check if the results are what they expected.
4. Round off the answer.

VOCABULARY: estimate, approximate

MOTIVATION:

1. Ask, "How high would you estimate the ceiling in this room to be?"
2. "A carton contains 16 books. If the box weighs $48\frac{1}{3}$ pounds, approximately how much does each book weigh?

DEVELOPMENT:

1. Very often we must get an answer with no room for error. Other times, as in the examples above, we allow more leeway.

   In example 1, if you guessed "8 feet" and the actual height turned out to be 8 feet 2 inches, you did a very good job! For all purposes, your estimation was accurate.

   Likewise, in example 2 we estimate the final result by approximating $48\frac{1}{3}$ as 48 and then dividing by 16. In symbols: $\frac{48\frac{1}{3}}{16} \approx \frac{48}{16} = 3$

   Ask, "How does our approximation compare with the actual result?" (It is SLIGHTLY less.)

2. In many real life situations, we approximate results. In a problem in which a calculation may be "messy" we often estimate a result in order to get a good idea about something.

   Example: "Tuna of the Sea" is on sale for $.87. Its usual price is $1.39.

   a) Without using your calculator ESTIMATE your savings ($1.40 - .90 = .50).
   b) Use your calculator to find exactly how much money you saved ($1.39 - .87 = .52). How do the two answers compare?

3. Write the following on the board:

   Procedure for Finding the Results of a Computation Problem.

   a) Approximate the results by rounding each number off to as many places you can deal with.
   b) Perform the calculations on a calculator.
   c) Ask "Are these results close to the expected answer?"
      No: Redo A and B
      YES: Round off the answer if needed.

4. Assign applications 1-4.
   Note - In example 3 it is easiest to approximate to tenths.

5. Do application 5 - Have students ROUND final answer to the nearest whole number 75.

6. Do application 6. Since rounding gives $12.71 and 12.71 × 7 = 88.97, someone will have to pay an extra penny! A better solution is for each to pay $12.72 (or $12.75 - it is easier to collect) and increase the tip!

7. Do applications 7 and 8.

APPLICATIONS:

In each case follow the three steps outlined for finding the results in a computation problem.

1. 88,987 - 39,461
2. $4.29 + $7.10 + $6.93 + $4.23
3. .231 + .598

4. 49 x 712

5. Your test scores are 63, 82, 79, 58, 91. Find the average.

6. Seven friends ate out together. If the check came out for 88.98 (including tax and tip), how much must each pay?

7. $\frac{623 \times 51}{23 \times 6}$ Give answer to nearest tenth.

8. $\frac{489.1 \times 5120 \times 12}{46.2 \times 309 \times 2.8}$ Give answer to the nearest whole number.

SOLUTIONS TO APPLICATION PROBLEMS:

Estimate	Actual Answer
1. 89000 - 39000 = 50000	49526
2. $4.00 + 7.00 + 7.00 + 4.00 = $22.00	$22.55
3. .2 + .6 = .8	.829
4. 50 x 700 = 35000	34888
5. (60+80+80+60+90)/5 = 370/5 = 74	$\frac{373}{5}$ = 74.6
6. 90/5 = $18	$\frac{88.98}{7}$ = 12.711428 rounding gives $12.71 It is easier to collect $12.75
7. $\frac{625 \times 50}{25 \times 5}$ = 25 x 5 = 125	$\frac{31773}{138}$ = 230.23913 rounding gives 230.2
8. $\frac{500 \times 5100 \times 12}{50 \times .300 \quad 3}$	$\frac{30050304}{39972.24}$ = 751.77933 rounding gives 752

SUMMARY:

Ask: 1. "What are the purposes of estimating an answer?"

2. "What are the three stages of finding the results of a computation problem (when a calculator is available)?"

CONSUMER MATHEMATICS

CALCULATORS

LESSON: 6

AIM: How do we use a calculator to help us balance a checkbook?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Use a calculator to find the balance as a result of a deposit.
2. Use a calculator to find the balance as a result of issuing a check.
3. Use a calculator to find the balance as a result of interest.
4. Use a calculator to find the balance as a result of several transactions.

VOCABULARY: deposit, withdrawal, transaction, balance

MOTIVATION:

1. Ask, "What is the purpose of having a checking account?"
2. Mr. Green had $1,817.71 in his checking account. If he has bills of $20, 20.45, 84.77, 30, 56, 8.10, 425.95, 251, and 750.00, does he have enough money to cover these expenses?

DEVELOPMENT:

1. Tell the class "Let us fill out Mr. Green's records for the above transaction."

RECORD ALL CHARGES THAT AFFECT YOUR ACCOUNT

Number	Date	Description of Transaction	Debit	Deposit(+)	BALANCE 1817.71
1433	12/1	To Jersey Oil Co.	20.00		20.00
		For gas (car)			1797.71
1434	12/1	To New York Telephone Co.	20.45		20.45
		For phone bill			1777.26
1435	12/1	To Fourth National Bank	84.77		84.77
		For charge card			1692.49
1436	12/1	To Dr. Smith	30.00		30.00
		For examination			1662.49
1437	12/1	To NY Gas Co.	56.00		56.00
		For gas (house)			1606.49
1438	12/1	To John's Book Store	8.10		8.10
		For new books			1598.39
1439	12/1	To B and T Dept. Store	425.95		425.95
		For new television			1172.44
1440	12/1	To Some City Insurance Co.	251.00		251.00
		For car insurance payment			921.44
1441	12/1	To D. Rump, Landlord	750.00		750.00
		For rent			171.44

2. Pass out rexographed blank "record sheets." With the class fill in all work except the remaining balance after each transaction.

3. Ask, "After filling out the payment we are making for a check, how do we calculate the balance?"
   Elicit: "We subtract: Previous balance - amount of transaction to get the New balance."

4. Fill out the balances by using a calculator. Note that on most calculators the "equals" keys do not have to be depressed. In the given problem, press 1817.71 -20 -. On the display should read 1797.71. Then press 20.45 - and see 177.26 etc. Check if the model your classes use calculates this way.

5. Ask, "After making all these checks out, how can we check that we have the correct balance?" Show the following method (in addition to those suggested). Press 171.44 + 750 + (and see 921.44 on the display) then press 251 + etc. By starting backwards and adding back the payments, we should end up with the original 187.71.

6. Ask, "What other types of transactions are there with checking accounts?" Elicit: Deposits and interest.

7. In the previous example, add a deposit of $1250 on 12/8. Be sure to write this in the deposit column and add to get $1421.44 as the new balance.

8. Assign applications 1-4 to reinforce when we add or subtract. Have students do these on calculators and check. Circulate to check that students are doing these correctly.

9. Do application 5 together with the class, helping them to organize the checkbook records.

10. Have students do application 6 at their seats.

APPLICATIONS:

Find the correct balance:

1. The original balance was $2208.27. On 5/4 check $1251 was made out to Jane Smith for $396.25.
2. The original balance was $482.19. On 8/4 a $275.63 deposit was made.
3. The bank added $3.65 interest to the account in ex. 1 above.
4. The bank added $4.02 interest to the account in ex. 2.
5. The opening (starting) balance was $1002.66. On 8/22 a deposit of $1892.82 was made. On 8/29 the following checks were made:

#1372	Roslyn O'Connor	$ 25.00	(gift)
1373	Dr. Philips	20.00	(visit)
1374	ABC Refrigeration	206.96	(fix air-condition)
1375	Jones Realty	391.00	(rent)
1376	Golf Oil	42.00	(gasoline)

On 8/31 interest of $2.46 was paid.

6. The opening balance was 1572.97. On 9/30 the bank paid $6.21 interest. On 10/4 the following checks were made:

#2878	Commissioner of Motor Vehicles	$55.00	(registration)
2879	Red Cross	25.00	(donation)
2880	Dr. Jones	29.00	(eye check up)
2881	Dana Johnson	30.00	(birthday gift)

On 10/6 a deposit of $934.00 was made and on 10/7 check 2882 was made to NY Telephone for $96.32.

SOLUTIONS TO APPLICATION PROBLEMS:

1.
$$\begin{array}{rr} & 2{,}208.27 \\ - & 396.25 \\ \hline & 1{,}812.02 \end{array}$$

2.
$$\begin{array}{rr} & 482.19 \\ + & 257.63 \\ \hline & 739.82 \end{array}$$

3.
$$\begin{array}{rr} & 1{,}812.02 \\ + & 3.65 \\ \hline & 1{,}815.67 \end{array}$$

4.
$$\begin{array}{rr} & 739.82 \\ + & 4.02 \\ \hline & 743.82 \end{array}$$

5.
$$\begin{array}{rr} & 1{,}002.66 \\ + & 1{,}892.82 \\ \hline & 2{,}895.48 \\ - & 25.00 \\ \hline & 2{,}870.48 \\ - & 20.00 \\ \hline & 2{,}850.48 \\ - & 206.96 \\ \hline & 2{,}643.52 \\ - & 391.00 \\ \hline & 2252.52 \\ - & 42.00 \\ \hline & 2{,}210.52 \\ + & 2.46 \\ \hline & 2{,}212.98 \end{array}$$

6.
$$\begin{array}{rr} & 1{,}572.97 \\ + & 6.21 \\ \hline & 1{,}579.18 \\ - & 55.00 \\ \hline & 1{,}524.18 \\ - & 25.00 \\ \hline & 1{,}499.18 \\ - & 29.00 \\ \hline & 1{,}470.18 \\ - & 30.00 \\ \hline & 1{,}440.18 \\ + & 934.00 \\ \hline & 2{,}374.18 \\ - & 96.32 \\ \hline & 2{,}277.86 \end{array}$$

SUMMARY:

Ask:
1. "When we are filling out a checkbook record, when do we add? subtract?"
2. "How do we check that our calculations are correct in a checkbook?"

CONSUMER MATHEMATICS
CALCULATORS
LESSON: 7

AIM: How do we use simple flowcharts to predict the output of a calculation?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Follow a flowchart to predict the output of a simple calculation or set of calculations.
2. Perform the operations called for in a given flowchart.
3. Find an error in the prediction (or performance) stages in using a given flowchart.

VOCABULARY: flowchart, input, operation, output

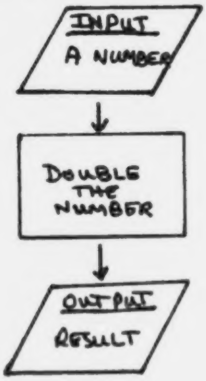
MOTIVATION:

Double each of the following numbers:

1) 73 2) 6.2 3) $5\frac{1}{4}$ 4) 731.24 5) 500000

DEVELOPMENT:

1. In the above problems, you performed the **SAME** operation on a set of different numbers. Often we use a **FLOWCHART** to list a set of instructions that must be repeated.
2. The above exercise corresponds to the following flowchart:

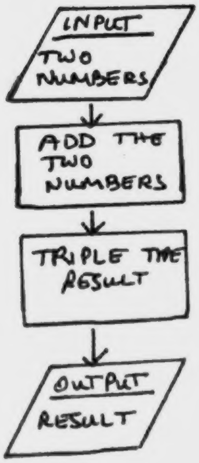


3. Note that we have TWO different flowcharting symbols here: a) A parallelogram is used to indicate that numbers be given ("INPUT") or that an answer has been found ("OUTPUT").
   b) A rectangle is used to indicate that a calculation is to be done.

4. Do Applications 1, 2, and 3.

5. Ask, "How does the following flowchart differ from the ones we have considered so far?" Elicit:
   a) Two numbers are input.
   b) Two operations are to be performed.

   Note that we have the option of using two or one calculation box. Often at the beginning, two are used for the sake of emphasis.



6. Use the flowchart to find the result when 4 and 12 are input (48).

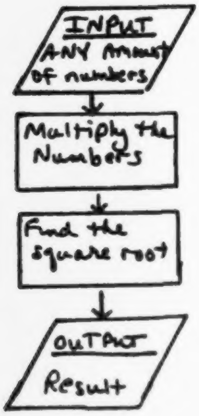
   Have the class do this for the following, also let them check their work using calculators.
   a) 12.4 and 5.6 (Answer 54)
   b) 7.12 and 4.06 (Answer 33.54)

7. Do Application 4. Ask, "What important number does this flowchart help us to calculate?" Elicit, the "average" or "arithmetic mean".

   Ask, "How would you modify the flowchart we just used so that we can use it to calculate the average of FIVE numbers?" Elicit "Change the Input box to 'Five numbers'." Change the 2 calculation boxes to: Add the five numbers and divide by 5.

8. Do Application 5.

9.


INPUT
ANY Amount of numbers
Multiply the Numbers
Find the square root
OUTPUT
Result

Someone used this flowchart with the data 12, 3, 1 and got the result 4. Ask, "Where was an error made?"

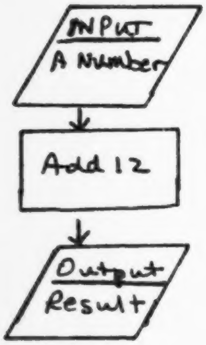
Elicit - The numbers were added, not multiplied.

10. Redo 9 with the data 25 and 16 and result 160000 (the square was found, NOT the square root).

APPLICATIONS:

Use the given flowchart to find the output for each given input. Check using a calculator.

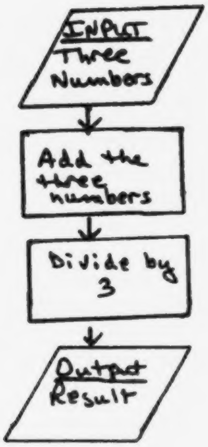
1. a) 26 b) 304 c) 16.4


INPUT
A Number
Add 12
Output
Result

2. Redo 1a, b, c changing "ADD 12" to "subtract 14".

3. Redo 1a, b, c changing "ADD 12" to "multiply by 3".

4.


INPUT
Three Numbers
Add the three numbers
Divide by 3
Output
Result

a) 90, 92, 100

b) 70, 70, 70

c) 80, 70, 100

5. Write a flowchart for multiplying two decimals.

SOLUTIONS TO APPLICATION PROBLEMS:

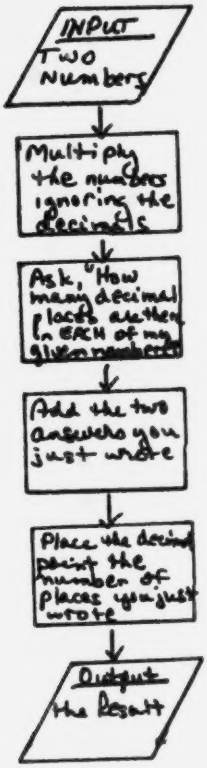
1a) 38 b) 316 c) 28.4

2a) 12 b) 290 c) 2.4

3a) 78 b) 912 c) 49.2

4a) 94 b) 70 c) 83.33333

5.


INPUT
Two Numbers
Multiply the numbers ignoring the decimals
Ask, "How many decimal places are there in EACH of my given numbers?"
Add the two answers you just wrote
Place the decimal point the number of places you just wrote
Output
the Result

SUMMARY:

Ask, "What is the purpose of a flowchart?"

Elicit that it summarizes a set of calculations we must do over and over again.

CONSUMER MATHEMATICS
CALCULATORS
LESSON: 8

AIM: What effect does changing the order of performing operations have on the results?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Use the order of operations to predict the correct output of a set of calculations.
2. Predict the results when the sequence of operations is switched.

VOCABULARY: order of operations

MOTIVATION:

In each case tell whether REVERSING THE ORDER makes a difference in the final result.

ORIGINAL	REVERSAL	CONCLUSION
1. Putting on your overcoat then putting on your shoes	(Have class fill in)	(Same results)
2. Putting on your socks then putting on your shoes	(Have class fill in)	(There is a big difference!)
3. Finding 3+5+8 by calculating 3+5 first	Finding 3+5+8 by calculating 5+8 first	(Same results:16)
4. Finding 10+2x3 by calculating 10+2 first	Finding 10+2x3 by calculating 2x3 first	(Different results-36 vs 16)

DEVELOPMENT:

1. Explain to the class that although we avoid disasterous results in life by **intuitively** following the correct order - as in example 2 above, we must be EXTRA careful to follow the correct order in mathematics since our intuition really cannot help!

2. In the early days of calculators, different brands of calculators would calculate 10+2x3 differently!! (The teacher may wish to demonstrate theis with two calculators - if available.) In order to be sure that we all get the same answer, we use the "Order of Operations."

3. **ORDER OF OPERATIONS - IN MATHEMATICS AND ON (MOST) CALCULATORS.**
   1) Perform all operations indicated within parentheses.
   2) Do all calculations involving powers.
   3) Perform all multiplications and divisions, in order, from left to right.
   4) Perform all additions and subtractions, in order, from left to right.

4. Demonstrate that 10+2x3 must be done by handling 2x3 first. Thus the answer 16 is the only acceptable one.

5. Do Applications 1-15. Note in several examples, one slight change in the placement of parentheses results in different answers. Also, on certain makes of calculators, the memory must be used, or students will have to check by writing partial answers.

APPLICATIONS:

Find the numerical value in each case. Check your results on your calculator. (Note to teacher - For this lesson, ONLY calculators adhering to the correct order of operations should be used.)

1. $12-4-3$
2. $12-(4-3)$
3. 3^2+4^2
4. $35\div7\times2$
5. $6-2+3+5-2\times3$
6. $3200\div5\times2^4$
7. $3200\div(5\times2^4)$
8. $(6\times3)\div(18\div3)$

9. (18÷3)÷6x3

10. (18÷3)÷(6x3)

11. (6x10)÷(5-2)

12. 6x10÷5-2

13. 6x(10÷5)-2

14. Place parentheses so that 6x10÷5-2 yields 0.

15. $(3^2+4)^2$

SOLUTIONS TO APPLICATION PROBLEMS:

1. 5
2. 11
3. 25
4. 10
5. 6
6. 10240
7. 40
8. 3
9. 3
10. $\frac{1}{3}$
11. 20
12. 10
13. 10
14. 6x(10÷5-2)
15. 169

SUMMARY:

1. Ask, "What is the order of operations?"
2. Ask, "What is the purpose of having an order of operations?"

CONSUMER MATHEMATICS

CALCULATORS

LESSON: 9

AIM: How do we use calculators to help do problems involving percents?

PERFORMANCE OBJECTIVES: The student will be able to use a calculator to...

1. Find a given percent of a number.
2. Find the discount on an item on sale.
3. Find the final price of an item on sale.
4. Check if their answers are reasonable.

VOCABULARY: percent, discount, sale price

MOTIVATION:

> CRAZY STEVE'S
> ELECTION DAY SALE
> 25% OFF
> ON EVERYTHING!!
> VCR'S - TV'S - STEREOS
> - RADIOS - WALKMAN -
> RECORDS - TAPES
> Printed on 100% recycled
> paper

Tell your class that this ad appeared recently. Ask, "What is the meaning of the last line?" (Elicit: 100% recycled paper means that the page **entirely** came from recycled paper.) Ask, "What is the meaning of "25% off?"

DEVELOPMENT:

1. Ask: What do we mean by 25%? Elicit: 25% means **every 25 out of 100**. How may we express 25%? Elicit: 25 out of 100 can also be written as $\frac{25}{100}$ or .25.
2. Suppose that Mr. Lee bought a new VCR that normally costs $350 (list price). Find his discount. Elicit: In order to find his discount, we need to find 25% of 350.

3. Elicit: **PROCEDURE TO FIND % OF A NUMBER.**
   - i) Change the % to a decimal by moving the decimal TWO places to the left. (Here: .25)
   - ii) Multiply the number by this decimal. (Here: .25 x 350 = $87.50)

4. Ask, "What does this amount mean to the VCR purchaser?" Elicit that this is his discount. His final cost will be $350 - 87.50 = $262.50. Have students note that this answer makes sense since he will still pay more than half the original price.

5. Write on the board upon eliciting from students:

   SUMMARY OF SALES TERMS

   LIST PRICE: The normal price of an item.

   RATE OF DISCOUNT: The % off because of a sale. This must be changed to a decimal.

   (AMOUNT OF) DISCOUNT: The AMOUNT of MONEY to be deducted.

   Amount of Discount = List Price x Decimal rate of discount

   SALE PRICE = LIST PRICE - DISCOUNT = the amount you pay

6. Do Applications 1 and 2.

7. Using calculators, do Applications 3-6.
   Class should be encouraged to:
   - a) Use memory for the list price.
   - b) Check if each answer makes sense.
   - c) Use the % button if your calculator has one.
   - d) Find a shortcut to skip finding the discount and getting the sale price more quickly. (Example 6 can be done by 125 x .85 = 106.25)

8. If time, have the class invent their own discount problems.

APPLICATIONS:

1. Change to a decimal:
   a) 16.2%   b) 3.64%   c) 91.3%   d) 200%

2. Change to a %: a) .73 b) .073 c) .642

In examples 3-6 complete the table.

Item	List Price	Rate of Discount	Decimal rate of Discount	Discount	Sale Price
3. TV Monitor	$605	10%			
4. Suit	400	30%			
5. Stereo	160	35%			
6. Pocket TV	125	15%			

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) .162 b) .0364 c) .913 d) 2.00

2. a) 73% b) 7.3% c) 64.2%

Item	List Price	Rate of Discount	Decimal rate of Discount	Discount	Sale Price
3. TV Monitor	$605	10%	.10	$ 60.50	$544.50
4. Suit	400	30%	.30	120.00	280.00
5. Stereo	160	35%	.35	56.00	104.00
6. Pocket TV	125	15%	.15	18.75	$106.25

SUMMARY:

1. Ask, "Why do stores have sales?"
2. Ask, "Why do stores use discount rate to figure your discount?" (Note psychological aspects as well as calculation aspects.)
3. Ask, "How is a sale price usually calculated?"

CONSUMER MATHEMATICS

CALCULATORS

LESSON: 10

AIM: How do we use calculators to help find sales tax?

PERFORMANCE OBJECTIVES: The student will be able to calculate (using a calculator):

1. The sales tax on a given item if the rate is given as a percent.
2. The total cost of an item if tax is to be included.
3. And check if their answers are reasonable.

VOCABULARY: sales tax, tax rate

MOTIVATION:

Ask, "If a store is selling a television for $300 you would not pay $300. Why not?" (Exclude the possibilities of bargaining the price down, getting the set through a friend etc.) Elicit that we must pay **SALES TAX**.
Ask, "What is the purpose of sales tax?"

DEVELOPMENT:

1. Discuss with the class: Sales tax is a "painless" way for states and cities to raise more money. A percent is tacked onto the price of articles consumers purchase. (It can be argued that rich people buy more and expensive articles so they are taxed more - as it should be!)
2. You are working in a hardware store. A consumer comes in to buy $45.50 worth of taxable goods. If the tax rate is 7%, find the total the consumer must hand over to you. (Note - Explain to the class that before modern electronics, people used printed tax tables to help.)

Write on the board upon eliciting from the class:

PROCEDURE FOR FINDING THE TOTAL COST INCLUDING SALES TAX	MODEL EXAMPLE
1. Change the tax rate from a % to a decimal by moving the decimal two places over to the left. Include an extra "leading 0" if needed.	1. 7% = .07. = .07
2. Multiply the cost x decimal rate.	2. Use a calculator to find 45.50 x .07 = 3.185
3. Since this number represents **MONEY** (the amount of tax the state of city gets), **ROUND** off this answer to the nearest cent.	3. $3.19 This is the sales tax.
4. Add this tax on to the original cost to get the total or final price the consumer must pay.	4. 45.50 + 3.19 $48.69 Answer
5. Check that your answer is reasonable. Redo the problem if your tax is more than the item or if your final cost is double or triple the original cost.	5. $3.19 is a small part of 45.50 thus the answer makes sense.

3. Do Applications 1-7. Discuss, for example, the high additional cost in buying a car. Point out that for this reason, we can deduct the sales tax on a car from our income on income tax forms. Shrewd people often invent devious methods of avoiding sales tax too!

4. Do Applications 8-11.

* 5. Optional - Do Application 12.

APPLICATIONS:

1. Change to a decimal.

   a) 6%   b) $7\frac{1}{2}$%   c) 19%   d) $8\frac{1}{4}$%

In examples 2-7 complete the table, using your calculator:

ITEM	COST	TAX RATE	SALES TAX	TOTAL COST
2. Television	300.00	8%		
3. Suit	220.00	6%		
4. Computer	650.00	$7\frac{1}{2}$%		
5. Walkman Radio	84.99	$8\frac{1}{4}$%		
6. New Car	145.50	9.3%		
7. Refrigerator	$603.00	21.2%		

(Note: Example 7 takes place in Taxachusetts!!)

In examples 8-11. State whether a student's answer appears to be reasonable or unreasonable:

8. A sales tax of $19.20 on a $240.00 item.

9. A total cost of $656.25 on a $75.00 item.

10. A total cost of $541.25 on a $500 VCR.

11. A sales tax of 17.68 on 25.25 purchase of record albums.

* 12. A guitar normally selling for $425.00 is on sale with a 25% discount. If the sales tax is $7\frac{3}{4}$%, find the final sales price.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) .06 b) .075 c) .19 d) .0825

ITEM	COST	TAX RATE	SALES TAX	TOTAL COST
2. Television	300.00	8%	$ 24.00	$ 324.00
3. Suit	220.00	6%	$ 13.20	$ 233.20
4. Computer	650.00	$7\frac{1}{2}$%	$ 48.75	$ 698.75
5. Walkman Radio	84.99	$8\frac{1}{4}$%	$ 7.01	$ 92.00
6. New Car	14,550.00	9.3%	$1353.15	$15903.15
7. Refrigerator	603.00	21.2%	$ 127.84	$ 730.84

8. REASONABLE

9. $656.25 is about NINE times the cost of the item! UNREASONABLE

10. **REASONABLE**

11. Unreasonable - The person probably misplaced a decimal point. $1.77 would seem more reasonable!

* 12. 425x.25 = $106.25
Sales price = $425-106.25 = $318.75
Sales tax = $24.70
Final Sales Price = $343.45

SUMMARY:

Ask, "How do we use the SALES TAX RATE to determine the final selling price?"

CONSUMER MATHEMATICS

CALCULATORS

LESSON: 11

AIM: How do we use calculators to find the total price of an article when we consider discounts and sales tax.

PERFORMANCE OBJECTIVES: The student will be able to...

1. Use a calculator to do problems involving two stages:
   a) Finding the price after a discount is considered.
   b) Finding the actual cost when sales tax is included
2. Check if the answers to such problems are reasonable.

VOCABULARY: discount, sales tax

MOTIVATION:

Write the following problem on the front board:

"A $130 radio is on sale at a 20% discount. The consumer must pay an 8% sales tax. What is the final cost to the consumer?"

Ask, "How is this problem different from previous ones that we have considered?" Elicit that this problem has TWO facts: a) Find the price after the discount is considered. b) Find the actual cost when sales tax is included.

DEVELOPMENT:

1. Distribute the calculators. If the calculators do not have a "%" key skip to section 2.

   Using a calculator, the above problem is greatly simplified and speeded up. (Note some calculators may differ a result, you may have to modify the following.) Elicit the solution to the above:

   a) Press $\boxed{1}\boxed{3}\boxed{0}\ \boxed{-}\ \boxed{2}\boxed{0}\boxed{\%}$

   The screen should display the number 104. This represents the sale price.

   b) Press $\boxed{+}\ \boxed{8}\boxed{\%}$

   The screen should display $112.32. This represents the final cost to the consumer. Ask, "Does this answer seem reasonable?" Since calculators, cash registers and computers differ in their use, students should be able to check their work using decimals.

2. To find the sale price, Elicit:
   a) Multiply 130 x .2 = 26 This represents the discount.
   b) Subtract 130 - 26 = 104 = sale price.

   To find the sales tax, Elicit:
   a) Multiply 104 x .08 = 8.32
   b) Add 104 + 8.32 = 112.32

   Ask, "Which method is easier?" Of course even those who are quite proficient at decimals will find the first approach easier.

3. Elicit and write on board:

   Amount of Discount = Original Price x Rate of Discount
   Sales Tax = Discounted Price x Rate of Tax
   Total Cost = Original Price - Amount of Discount + Sales Tax

   Do Applications 1-7. Note that some of the results must be rounded to the nearest penny! Be sure that your students are checking to see that their answers makes sense. You may purposely make an error for them to spot!

4. Do Applications 8, 9.

5. Explore the notions in Applications 10 and 11.

APPLICATIONS:

Complete the table using your calculator.

Item	Original Price	% Discount	Sale Price	% Sales Tax	Final Cost
1) album	$ 9.50	10%		5%	
2) guitar	$400.00	25%		7%	
3) television	$535.00	15%		$6\frac{1}{2}$%	
4) VCR	$625.00	20%		$8\frac{1}{4}$%	
5) clothes on sale	$425.50	30%		$7\frac{3}{4}$%	
6) couch	$750.00	12%		$8\frac{1}{2}$%	
7) video tape	$ 24.95	20%		$9\frac{1}{4}$%	

8-9) Redo examples 1 and 2 without using a % key.

10) Reverse the % discount and the % sales tax in example 1. Will the final cost change?

11) Use example 2 to see if subtracting the two rates gives a single new rate that can be used to get the final cost.

SOLUTIONS TO APPLICATION PROBLEMS:

Item	Original Price	% Discount	Sale Price	% Sales Tax	Final Cost
1) album	$ 9.50	10%	$ 8.55	5%	$ 8.98
2) guitar	$400.00	25%	$300.00	7%	$321.00
3) television	$535.00	15%	$454.75	$6\frac{1}{2}$%	$484.31
4) VCR	$625.00	20%	$500.00	$8\frac{1}{4}$%	$541.25
5) clothes on sale	$425.50	30%	$297.85	$7\frac{3}{4}$%	$320.93
6) couch	$750.00	12%	$660.00	$8\frac{1}{2}$%	$716.10
7) video tape	$ 24.95	20%	$ 19.96	$9\frac{1}{4}$%	$ 21.81

8) Discount = $.95
Sale Price = $9.50 - .95 = $8.55
Sales Tax = $.43
Final Cost = $8.55 + .43 = $8.98

9) Discount = $100
Sale Price = $400 - 100 = $300
Sales Tax = $21
Final Cost = $300 + 21 = $321.00

10) Sale Price = $9.02 Final Cost = $9.92
Final Cost is different! This makes sense since a smaller discount (5%) was given.

11) 400(.18) = $72 400 - 72 = $328
This method does NOT give the correct answer.

SUMMARY:

Ask, "How does a % key on a calculator help a cashier?"

Elicit that without it, discounts and sales taxes would take many more steps to deal with.

CONSUMER MATHEMATICS

CALCULATORS

LESSON: 12

AIM: How do we use calculators to aid us in filling out tax forms?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Use a tax schedule along with a calculator to find the total amount of tax that must be paid.
2. Check if their answers to such problems are reasonable.

VOCABULARY: total income, adjusted gross income, taxable income, withholding tax payment

MOTIVATION:

Distribute copies of the tax tables (2 pages) included in this plan. Pose the following problem:

Mr. Jones is the head of a household. His taxable income was $30872. Determine the amount of his Federal Income Tax.

DEVELOPMENT:

1. In the above problem, we have to be able to read the tax tables. Locate "30850 to 30900". Since Mr. Jones is head of a household, read the last column: $5795.
2. In the above problem, suppose the government had withheld 5348. Ask, "What must Mr. Jones do?" (Elicit he must pay another $447.
3. Elicit the following definitions with regards to income tax and write on the board:

   DEFINITIONS:

   a) **TOTAL INCOME:** This includes all money obtained during year including wages, tips, interest, pensions, business income, etc.

   b) **ADJUSTED GROSS INCOME:** This is calculated by deducting all "adjustments" such as certain expenses, IRA payments etc. from your total income.

c) **TAXABLE INCOME:** This is calculated by taking your adjusted gross income and subtracting money allowed for exemptions, itemized deductions and other credits. The tax tables are based on this amount.

4. Use the tax table and your calculator to determine what you are to do if you are single, had a taxable income of $26799 and had $5005 withheld. Elicit that you will get 5005 - 4978 = $27 back as your "tax return" or "tax refund".

5. Do Applications 1-5. Be sure your students use the correct columns.

6. Do Applications 6-9.

   * In each case be sure students reject answers in which the tax payment is a) bigger than the income. b) smaller than the refund.

7. Have class consider the following problem: Mr. Rodriguez earned a taxable income of $26108 last year. He is married and files jointly. If his employer withheld $84.23 each week will he get a refund or must he pay the government?

   Elicit that he had 84.23 x 52 = $4379.96 withheld last year. Since the table indicates he must pay $3737, then he gets a refund of $4379.96 - $3737 = $642.96

APPLICATIONS:

Use your Tax Table to determine your Federal Income Tax given your taxable income:

1) $28053 - head of household
2) $34450 - married filing jointly
3) $32961 - married filing separately
4) $26567 - single
5) $40222 - head of household

Determine if you still owe money or if you will receive a refund (and how much).

6) You file jointly earned a taxable income of 38724 and had $7649 withheld.

7. You file separately and earned a taxable income of $26338 and paid $5842 in withholding taxes.

8. You file as a single and earned 39668 in taxable income. $9742 was withheld.

9. Explain why someone who is single pays much less than a married person filing separately throughout the table.

SOLUTIONS TO APPLICATION PROBLEMS:

1. $4975
2. $5925
3. $8629
4. $4918
5. $8929
6. $7649 - $7220 = $429 refund to you
7. $6032 - $5842 = $190 you still owe
8. $9742 - $9404 = $338 refund
9. Other deductions and benefits were used in calculating the taxable income which really narrows the gap.

SUMMARY:

Say: "If the taxable income is $36183, compare the different amount of tax that is paid under the different tax categories."

1985 Tax Table—*Continued*

If line 37 (taxable income) is—		And you are—			
At least	But less than	Single	Married filing jointly *	Married filing sepa-rately	Head of a house-hold
		Your tax is—			
23,000					
23,000	23,050	3,911	3,039	4,819	3,618
23,050	23,100	3,924	3,050	4,835	3,630
23,100	23,150	3,937	3,061	4,852	3,642
23,150	23,200	3,950	3,072	4,868	3,654
23,200	23,250	3,963	3,083	4,885	3,666
23,250	23,300	3,976	3,094	4,901	3,678
23,300	23,350	3,989	3,105	4,918	3,690
23,350	23,400	4,002	3,116	4,934	3,702
23,400	23,450	4,015	3,127	4,951	3,714
23,450	23,500	4,028	3,138	4,967	3,726
23,500	23,550	4,041	3,149	4,984	3,738
23,550	23,600	4,054	3,160	5,000	3,750
23,600	23,650	4,067	3,171	5,017	3,762
23,650	23,700	4,080	3,182	5,033	3,774
23,700	23,750	4,093	3,193	5,050	3,786
23,750	23,800	4,106	3,204	5,066	3,798
23,800	23,850	4,119	3,215	5,083	3,810
23,850	23,900	4,132	3,226	5,101	3,822
23,900	23,950	4,145	3,237	5,120	3,834
23,950	24,000	4,158	3,248	5,139	3,846
24,000					
24,000	24,050	4,171	3,259	5,158	3,858
24,050	24,100	4,184	3,270	5,177	3,870
24,100	24,150	4,197	3,281	5,196	3,882
24,150	24,200	4,210	3,292	5,215	3,894
24,200	24,250	4,223	3,303	5,234	3,906
24,250	24,300	4,236	3,314	5,253	3,918
24,300	24,350	4,249	3,325	5,272	3,930
24,350	24,400	4,262	3,336	5,291	3,942
24,400	24,450	4,275	3,347	5,310	3,954
24,450	24,500	4,288	3,358	5,329	3,967
24,500	24,550	4,303	3,369	5,348	3,981
24,550	24,600	4,318	3,380	5,367	3,995
24,600	24,650	4,333	3,391	5,386	4,009
24,650	24,700	4,348	3,402	5,405	4,023
24,700	24,750	4,363	3,413	5,424	4,037
24,750	24,800	4,378	3,424	5,443	4,051
24,800	24,850	4,393	3,435	5,462	4,065
24,850	24,900	4,408	3,446	5,481	4,079
24,900	24,950	4,423	3,457	5,500	4,093
24,950	25,000	4,438	3,468	5,519	4,107
25,000					
25,000	25,050	4,453	3,479	5,538	4,121
25,050	25,100	4,468	3,490	5,557	4,135
25,100	25,150	4,483	3,501	5,576	4,149
25,150	25,200	4,498	3,512	5,595	4,163
25,200	25,250	4,513	3,523	5,614	4,177
25,250	25,300	4,528	3,534	5,633	4,191
25,300	25,350	4,543	3,545	5,652	4,205
25,350	25,400	4,558	3,556	5,671	4,219
25,400	25,450	4,573	3,567	5,690	4,233
25,450	25,500	4,588	3,578	5,709	4,247
25,500	25,550	4,603	3,589	5,728	4,261
25,550	25,600	4,618	3,600	5,747	4,275
25,600	25,650	4,633	3,612	5,766	4,289
25,650	25,700	4,648	3,624	5,785	4,303
25,700	25,750	4,663	3,637	5,804	4,317
25,750	25,800	4,678	3,649	5,823	4,331
25,800	25,850	4,693	3,662	5,842	4,345
25,850	25,900	4,708	3,674	5,861	4,359
25,900	25,950	4,723	3,687	5,880	4,373
25,950	26,000	4,738	3,699	5,899	4,387
26,000					
26,000	26,050	4,753	3,712	5,918	4,401
26,050	26,100	4,768	3,724	5,937	4,415
26,100	26,150	4,783	3,737	5,956	4,429
26,150	26,200	4,798	3,749	5,975	4,443
26,200	26,250	4,813	3,762	5,994	4,457
26,250	26,300	4,828	3,774	6,013	4,471
26,300	26,350	4,843	3,787	6,032	4,485
26,350	26,400	4,858	3,799	6,051	4,499
26,400	26,450	4,873	3,812	6,070	4,513
26,450	26,500	4,888	3,824	6,089	4,527
26,500	26,550	4,903	3,837	6,108	4,541
26,550	26,600	4,918	3,849	6,127	4,555
26,600	26,650	4,933	3,862	6,146	4,569
26,650	26,700	4,948	3,874	6,165	4,583
26,700	26,750	4,963	3,887	6,184	4,597
26,750	26,800	4,978	3,899	6,203	4,611
26,800	26,850	4,993	3,912	6,222	4,625
26,850	26,900	5,008	3,924	6,241	4,639
26,900	26,950	5,023	3,937	6,260	4,653
26,950	27,000	5,038	3,949	6,279	4,667
27,000					
27,000	27,050	5,053	3,962	6,298	4,681
27,050	27,100	5,068	3,974	6,317	4,695
27,100	27,150	5,083	3,987	6,336	4,709
27,150	27,200	5,098	3,999	6,355	4,723
27,200	27,250	5,113	4,012	6,374	4,737
27,250	27,300	5,128	4,024	6,393	4,751
27,300	27,350	5,143	4,037	6,412	4,765
27,350	27,400	5,158	4,049	6,431	4,779
27,400	27,450	5,173	4,062	6,450	4,793
27,450	27,500	5,188	4,074	6,469	4,807
27,500	27,550	5,203	4,087	6,488	4,821
27,550	27,600	5,218	4,099	6,507	4,835
27,600	27,650	5,233	4,112	6,526	4,849
27,650	27,700	5,248	4,124	6,545	4,863
27,700	27,750	5,263	4,137	6,564	4,877
27,750	27,800	5,278	4,149	6,583	4,891
27,800	27,850	5,293	4,162	6,602	4,905
27,850	27,900	5,308	4,174	6,621	4,919
27,900	27,950	5,323	4,187	6,640	4,933
27,950	28,000	5,338	4,199	6,659	4,947
28,000					
28,000	28,050	5,353	4,212	6,678	4,961
28,050	28,100	5,368	4,224	6,697	4,975
28,100	28,150	5,383	4,237	6,716	4,989
28,150	28,200	5,398	4,249	6,735	5,003
28,200	28,250	5,413	4,262	6,754	5,017
28,250	28,300	5,428	4,274	6,773	5,031
28,300	28,350	5,443	4,287	6,792	5,045
28,350	28,400	5,458	4,299	6,811	5,059
28,400	28,450	5,473	4,312	6,830	5,073
28,450	28,500	5,488	4,324	6,849	5,087
28,500	28,550	5,503	4,337	6,868	5,101
28,550	28,600	5,518	4,349	6,887	5,115
28,600	28,650	5,533	4,362	6,906	5,129
28,650	28,700	5,548	4,374	6,925	5,143
28,700	28,750	5,563	4,387	6,944	5,157
28,750	28,800	5,578	4,399	6,963	5,171
28,800	28,850	5,593	4,412	6,982	5,185
28,850	28,900	5,608	4,424	7,001	5,199
28,900	28,950	5,623	4,437	7,020	5,213
28,950	29,000	5,638	4,449	7,039	5,227
29,000					
29,000	29,050	5,653	4,462	7,058	5,241
29,050	29,100	5,668	4,474	7,077	5,255
29,100	29,150	5,683	4,487	7,096	5,269
29,150	29,200	5,698	4,499	7,115	5,283
29,200	29,250	5,713	4,512	7,134	5,297
29,250	29,300	5,728	4,524	7,153	5,311
29,300	29,350	5,743	4,537	7,172	5,325
29,350	29,400	5,758	4,549	7,191	5,339
29,400	29,450	5,773	4,562	7,210	5,353
29,450	29,500	5,788	4,574	7,229	5,367
29,500	29,550	5,803	4,587	7,248	5,381
29,550	29,600	5,818	4,599	7,267	5,395
29,600	29,650	5,833	4,612	7,286	5,409
29,650	29,700	5,848	4,624	7,305	5,423
29,700	29,750	5,863	4,637	7,324	5,437
29,750	29,800	5,878	4,649	7,343	5,451
29,800	29,850	5,893	4,662	7,362	5,465
29,850	29,900	5,908	4,674	7,381	5,479
29,900	29,950	5,923	4,687	7,400	5,493
29,950	30,000	5,938	4,699	7,419	5,507
30,000					
30,000	30,050	5,955	4,712	7,438	5,523
30,050	30,100	5,972	4,724	7,457	5,539
30,100	30,150	5,989	4,737	7,476	5,555
30,150	30,200	6,006	4,749	7,495	5,571
30,200	30,250	6,023	4,762	7,514	5,587
30,250	30,300	6,040	4,774	7,533	5,603
30,300	30,350	6,057	4,787	7,552	5,619
30,350	30,400	6,074	4,799	7,571	5,635
30,400	30,450	6,091	4,812	7,590	5,651
30,450	30,500	6,108	4,824	7,609	5,667
30,500	30,550	6,125	4,837	7,628	5,683
30,550	30,600	6,142	4,849	7,647	5,699
30,600	30,650	6,159	4,862	7,666	5,715
30,650	30,700	6,176	4,874	7,685	5,731
30,700	30,750	6,193	4,887	7,704	5,747
30,750	30,800	6,210	4,899	7,723	5,763
30,800	30,850	6,227	4,912	7,742	5,779
30,850	30,900	6,244	4,924	7,761	5,795
30,900	30,950	6,261	4,937	7,780	5,811
30,950	31,000	6,278	4,949	7,799	5,827
31,000					
31,000	31,050	6,295	4,962	7,818	5,843
31,050	31,100	6,312	4,974	7,837	5,859
31,100	31,150	6,329	4,987	7,856	5,875
31,150	31,200	6,346	5,001	7,875	5,891
31,200	31,250	6,363	5,015	7,894	5,907
31,250	31,300	6,380	5,029	7,915	5,923
31,300	31,350	6,397	5,043	7,936	5,939
31,350	31,400	6,414	5,057	7,957	5,955
31,400	31,450	6,431	5,071	7,978	5,971
31,450	31,500	6,448	5,085	7,999	5,987
31,500	31,550	6,465	5,099	8,020	6,003
31,550	31,600	6,482	5,113	8,041	6,019
31,600	31,650	6,499	5,127	8,062	6,035
31,650	31,700	6,516	5,141	8,083	6,051
31,700	31,750	6,533	5,155	8,104	6,067
31,750	31,800	6,550	5,169	8,125	6,083
31,800	31,850	6,567	5,183	8,146	6,099
31,850	31,900	6,584	5,197	8,167	6,115
31,900	31,950	6,601	5,211	8,188	6,131
31,950	32,000	6,618	5,225	8,209	6,147

* This column must also be used by a qualifying widow(er).

Continued on next page

If line 37 (taxable income) is—		And you are—			
At least	But less than	Single	Married filing jointly *	Married filing separately	Head of a household
		Your tax is—			
32,000					
32,000	32,050	6,635	5,239	8,230	6,163
32,050	32,100	6,652	5,253	8,251	6,179
32,100	32,150	6,669	5,267	8,272	6,195
32,150	32,200	6,686	5,281	8,293	6,211
32,200	32,250	6,703	5,295	8,314	6,227
32,250	32,300	6,720	5,309	8,335	6,243
32,300	32,350	6,737	5,323	8,356	6,259
32,350	32,400	6,754	5,337	8,377	6,275
32,400	32,450	6,771	5,351	8,398	6,291
32,450	32,500	6,788	5,365	8,419	6,307
32,500	32,550	6,805	5,379	8,440	6,323
32,550	32,600	6,822	5,393	8,461	6,339
32,600	32,650	6,839	5,407	8,482	6,355
32,650	32,700	6,856	5,421	8,503	6,371
32,700	32,750	6,873	5,435	8,524	6,387
32,750	32,800	6,890	5,449	8,545	6,403
32,800	32,850	6,907	5,463	8,566	6,419
32,850	32,900	6,924	5,477	8,587	6,435
32,900	32,950	6,941	5,491	8,608	6,451
32,950	33,000	6,958	5,505	8,629	6,467
33,000					
33,000	33,050	6,975	5,519	8,650	6,483
33,050	33,100	6,992	5,533	8,671	6,499
33,100	33,150	7,009	5,547	8,692	6,515
33,150	33,200	7,026	5,561	8,713	6,531
33,200	33,250	7,043	5,575	8,734	6,547
33,250	33,300	7,060	5,589	8,755	6,563
33,300	33,350	7,077	5,603	8,776	6,579
33,350	33,400	7,094	5,617	8,797	6,595
33,400	33,450	7,111	5,631	8,818	6,611
33,450	33,500	7,128	5,645	8,839	6,627
33,500	33,550	7,145	5,659	8,860	6,643
33,550	33,600	7,162	5,673	8,881	6,659
33,600	33,650	7,179	5,687	8,902	6,675
33,650	33,700	7,196	5,701	8,923	6,691
33,700	33,750	7,213	5,715	8,944	6,707
33,750	33,800	7,230	5,729	8,965	6,723
33,800	33,850	7,247	5,743	8,986	6,739
33,850	33,900	7,264	5,757	9,007	6,755
33,900	33,950	7,281	5,771	9,028	6,771
33,950	34,000	7,298	5,785	9,049	6,787
34,000					
34,000	34,050	7,315	5,799	9,070	6,803
34,050	34,100	7,332	5,813	9,091	6,819
34,100	34,150	7,349	5,827	9,112	6,835
34,150	34,200	7,366	5,841	9,133	6,851
34,200	34,250	7,383	5,855	9,154	6,867
34,250	34,300	7,400	5,869	9,175	6,883
34,300	34,350	7,417	5,883	9,196	6,899
34,350	34,400	7,434	5,897	9,217	6,915
34,400	34,450	7,451	5,911	9,238	6,931
34,450	34,500	7,468	5,925	9,259	6,947
34,500	34,550	7,485	5,939	9,280	6,963
34,550	34,600	7,502	5,953	9,301	6,979
34,600	34,650	7,519	5,967	9,322	6,995
34,650	34,700	7,536	5,981	9,343	7,011
34,700	34,750	7,553	5,995	9,364	7,027
34,750	34,800	7,570	6,009	9,385	7,043
34,800	34,850	7,587	6,023	9,406	7,059
34,850	34,900	7,604	6,037	9,427	7,075
34,900	34,950	7,621	6,051	9,448	7,091
34,950	35,000	7,638	6,065	9,469	7,107
35,000					
35,000	35,050	7,655	6,079	9,490	7,123
35,050	35,100	7,672	6,093	9,511	7,139
35,100	35,150	7,689	6,107	9,532	7,155
35,150	35,200	7,706	6,121	9,553	7,171
35,200	35,250	7,723	6,135	9,574	7,187
35,250	35,300	7,740	6,149	9,595	7,203
35,300	35,350	7,757	6,163	9,616	7,219
35,350	35,400	7,774	6,177	9,637	7,235
35,400	35,450	7,791	6,191	9,658	7,251
35,450	35,500	7,808	6,205	9,679	7,267
35,500	35,550	7,827	6,219	9,700	7,284
35,550	35,600	7,846	6,233	9,721	7,301
35,600	35,650	7,865	6,247	9,742	7,319
35,650	35,700	7,884	6,261	9,763	7,336
35,700	35,750	7,903	6,275	9,784	7,354
35,750	35,800	7,922	6,289	9,805	7,371
35,800	35,850	7,941	6,303	9,826	7,389
35,850	35,900	7,960	6,317	9,847	7,406
35,900	35,950	7,979	6,331	9,868	7,424
35,950	36,000	7,998	6,345	9,889	7,441
36,000					
36,000	36,050	8,017	6,359	9,910	7,459
36,050	36,100	8,036	6,373	9,931	7,476
36,100	36,150	8,055	6,387	9,952	7,494
36,150	36,200	8,074	6,401	9,973	7,511
36,200	36,250	8,093	6,415	9,994	7,529
36,250	36,300	8,112	6,429	10,015	7,546
36,300	36,350	8,131	6,443	10,036	7,564
36,350	36,400	8,150	6,457	10,057	7,581
36,400	36,450	8,169	6,471	10,078	7,599
36,450	36,500	8,188	6,485	10,099	7,616
36,500	36,550	8,207	6,499	10,120	7,634
36,550	36,600	8,226	6,513	10,141	7,651
36,600	36,650	8,245	6,527	10,162	7,669
36,650	36,700	8,264	6,543	10,183	7,686
36,700	36,750	8,283	6,560	10,204	7,704
36,750	36,800	8,302	6,576	10,225	7,721
36,800	36,850	8,321	6,593	10,246	7,739
36,850	36,900	8,340	6,609	10,267	7,756
36,900	36,950	8,359	6,626	10,288	7,774
36,950	37,000	8,378	6,642	10,309	7,791
37,000					
37,000	37,050	8,397	6,659	10,330	7,809
37,050	37,100	8,416	6,675	10,351	7,826
37,100	37,150	8,435	6,692	10,372	7,844
37,150	37,200	8,454	6,708	10,393	7,861
37,200	37,250	8,473	6,725	10,414	7,879
37,250	37,300	8,492	6,741	10,435	7,896
37,300	37,350	8,511	6,758	10,456	7,914
37,350	37,400	8,530	6,774	10,477	7,931
37,400	37,450	8,549	6,791	10,498	7,949
37,450	37,500	8,568	6,807	10,519	7,966
37,500	37,550	8,587	6,824	10,540	7,984
37,550	37,600	8,606	6,840	10,561	8,001
37,600	37,650	8,625	6,857	10,582	8,019
37,650	37,700	8,644	6,873	10,603	8,036
37,700	37,750	8,663	6,890	10,624	8,054
37,750	37,800	8,682	6,906	10,645	8,071
37,800	37,850	8,701	6,923	10,666	8,089
37,850	37,900	8,720	6,939	10,687	8,106
37,900	37,950	8,739	6,956	10,708	8,124
37,950	38,000	8,758	6,972	10,729	8,141
38,000					
38,000	38,050	8,777	6,989	10,750	8,159
38,050	38,100	8,796	7,005	10,771	8,176
38,100	38,150	8,815	7,022	10,792	8,194
38,150	38,200	8,834	7,038	10,813	8,211
38,200	38,250	8,853	7,055	10,834	8,229
38,250	38,300	8,872	7,071	10,855	8,246
38,300	38,350	8,891	7,088	10,876	8,264
38,350	38,400	8,910	7,104	10,897	8,281
38,400	38,450	8,929	7,121	10,918	8,299
38,450	38,500	8,948	7,137	10,939	8,316
38,500	38,550	8,967	7,154	10,960	8,334
38,550	38,600	8,986	7,170	10,981	8,351
38,600	38,650	9,005	7,187	11,002	8,369
38,650	38,700	9,024	7,203	11,023	8,386
38,700	38,750	9,043	7,220	11,044	8,404
38,750	38,800	9,062	7,236	11,065	8,421
38,800	38,850	9,081	7,253	11,086	8,439
38,850	38,900	9,100	7,269	11,107	8,456
38,900	38,950	9,119	7,286	11,128	8,474
38,950	39,000	9,138	7,302	11,149	8,491
39,000					
39,000	39,050	9,157	7,319	11,170	8,509
39,050	39,100	9,176	7,335	11,191	8,526
39,100	39,150	9,195	7,352	11,212	8,544
39,150	39,200	9,214	7,368	11,233	8,561
39,200	39,250	9,233	7,385	11,254	8,579
39,250	39,300	9,252	7,401	11,275	8,596
39,300	39,350	9,271	7,418	11,296	8,614
39,350	39,400	9,290	7,434	11,317	8,631
39,400	39,450	9,309	7,451	11,338	8,649
39,450	39,500	9,328	7,467	11,359	8,666
39,500	39,550	9,347	7,484	11,380	8,684
39,550	39,600	9,366	7,500	11,401	8,701
39,600	39,650	9,385	7,517	11,422	8,719
39,650	39,700	9,404	7,533	11,443	8,736
39,700	39,750	9,423	7,550	11,464	8,754
39,750	39,800	9,442	7,566	11,485	8,771
39,800	39,850	9,461	7,583	11,506	8,789
39,850	39,900	9,480	7,599	11,527	8,806
39,900	39,950	9,499	7,616	11,548	8,824
39,950	40,000	9,518	7,632	11,569	8,841
40,000					
40,000	40,050	9,537	7,649	11,590	8,859
40,050	40,100	9,556	7,665	11,611	8,876
40,100	40,150	9,575	7,682	11,632	8,894
40,150	40,200	9,594	7,698	11,653	8,911
40,200	40,250	9,613	7,715	11,674	8,929
40,250	40,300	9,632	7,731	11,695	8,946
40,300	40,350	9,651	7,748	11,716	8,964
40,350	40,400	9,670	7,764	11,737	8,981
40,400	40,450	9,689	7,781	11,758	8,999
40,450	40,500	9,708	7,797	11,779	9,016
40,500	40,550	9,727	7,814	11,800	9,034
40,550	40,600	9,746	7,830	11,821	9,051
40,600	40,650	9,765	7,847	11,842	9,069
40,650	40,700	9,784	7,863	11,863	9,086
40,700	40,750	9,803	7,880	11,884	9,104
40,750	40,800	9,822	7,896	11,905	9,121
40,800	40,850	9,841	7,913	11,926	9,139
40,850	40,900	9,860	7,929	11,947	9,156
40,900	40,950	9,879	7,946	11,968	9,174
40,950	41,000	9,898	7,962	11,989	9,191

* This column must also be used by a qualifying widow(er).

Continued on next page

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 1

AIM: How can the cost of commuting to work be determined?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Add, subtract and multiply decimals.
2. Compute the cost of commuting to work if:
   a) One form of transportation is used.
   b) More than one form of transportation is used.
3. Compute the total commuting costs given the:
   a) One-way fare and the number of working days in the month.
   b) Monthly train fare, one-way subway fare and the number of days in the month.

VOCABULARY: commute

MOTIVATION:

Arthur, upon graduating high school, secured a job in the city. Ask, "What expenses must Arthur consider in his budget connected with getting to and from work?" Elicit: Travel expenses (commuting back and forth from home to work). Ask, "What options does Arthur have in traveling to and from work?" Elicit: Modes of transportation - car, bus, subway, commuter railroad, express bus.

DEVELOPMENT:

1. Using the motivation problem, students should explore various modes of transportation. The cost and convenience of each method should be discussed. For example: Car (gas, tolls, parking, maintenance, repairs, traffic) vs. bus, etc.
2. Do Application #1.

3. Discuss need to multiply, add and subtract decimals, if fare is given in cents. Review operations with decimals. (Perhaps several of these problems could be given in previous homework assignments.)

4. Do Application #2.

5. Discuss the fact that some people use more than one form of transportation to commute to work. For example: bus and subway, commuter railroad and subway.

6. Do Application #3.

7. Discuss the fact that sometimes a decision to take a job is based on how convenient it is to get to work and the cost of commuting.

8. Do Application #4.

APPLICATIONS:

1. Arthur takes the bus to work each day. If the bus fare is $1 each way, find:
   a) The cost of commuting during a five-day work week.
   b) The monthly cost of commuting if a month averages 22 working days.
   c) The yearly cost of commuting based on 22 working days per month and a 10 day vacation.

2. a) Multiply each of the following:
   1) 1.2 x 15 2) 4.20 x 21 3) 3.25 x 18
   b) Add and subtract each of the following:
   1) 3.25 and 2.90 2) 4.6 and 1.85

3. Arthur's sister takes the commuter railroad and the subway to her job. If the monthly railroad ticket costs $98.60 and the subway is $1 each way, find:
   a) The total cost of commuting for a month of 22 working days.
   b) The yearly cost of commuting if there is an average of 22 working days in a month and 10 days vacation per year.

4. Compare the following jobs with travel costs in mind. Assume all other factors are the same.

a) Job A pays $15,792 a year. Commuting is by subway and a bus one way. The fare is 90 cents each. There is 22 working days a month with 21 days vacation each year.

b) Job B pays $16,200 a year. Commuting is by commuter railroad. The monthly ticket costs $88.50. There is a one month vacation.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) $2 per day x 5 = $10 weekly
b) $2 x 22 = $44 per month
c) $44 x 12 = $528
- 20 for vacation days
$508 total

2. a) 1) 18 2) 88.2 3) 58.5
b) 1) 6.15; .35 2) 6.45; 2.75

3. a) $98.60 + $44.00 = $ 142.60 per month.
b) $142.60 x 12 = $1711.20
- 20.00 vacation days
$1691.20

Reminder: A monthly train ticket remains constant unless one elects to buy a daily or weekly train ticket, if available.

4. a) $ .90 x 4 = $ 3.60 daily fare.
$ 3.60 x 22 = $ 79.20 per month.
$79.20 x 12 = $950.40 per year.
less $ 3.60 x 21 = $ 75.60 vacation days
$874.80 total

$15,792.00
- 874.80
$14,917.20 net after travel

b) $88.50 x 11 = $973.50 railroad.

$16,200.00
- 973.50
$15,226.50 net after travel.

SUMMARY:

1. What factors must be considered in determining the cost of commuting to work?

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 2

AIM: How can we find the total number of hours worked?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Add fractions and mixed numbers.
2. Express hours and minutes as fractions.
3. Determine the number of hours worked from time cards per day by computing the difference between time-in and time-out.
4. Determine the number of hours worked per week.

MOTIVATION:

One week John worked 4 hours each day after school. Ask, "In a 5 day school week, how many hours did John work?" Elicit: 20 hours. During a second week, John worked $4\frac{1}{2}$ hours each day after school. Ask, "In a 5 day week, how many hours did John work during the second week?" Elicit: $22\frac{1}{2}$ hours.

DEVELOPMENT:

1. Using the motivation problem, review adding and subtracting fractions and mixed numbers (perhaps these problems can be given in the previous homework assignments).
2. Do Application #1.
3. Practice converting minutes into fractional parts of an hour.
4. Do Application #2.

5. Ask: "If John worked the following hours last week, find the total number of hours worked for the week."

Monday	3 hours	45 minutes
Tuesday	4 hours	15 minutes
Wednesday	4 hours	30 minutes
Thursday	3 hours	45 minutes
Friday	4 hours	45 minutes

Elicit: 21 hours.

6. Do Application #3.

7. John has to punch a time card each day to reflect the number of hours he worked each day. Ask, "If John punched in at 3:15 P.M. and punched out at 7:45 P.M., how many hours did he work?" Elicit: $4\frac{1}{2}$ hours.

8. Do Application #4.

APPLICATIONS:

1. Add; subtract each of the following:

a) $\begin{array}{r} \frac{5}{4} \\ \frac{3}{4} \\ \hline \end{array}$ b) $\begin{array}{r} \frac{3}{4} \\ \frac{1}{2} \\ \hline \end{array}$ c) $\begin{array}{r} \frac{3}{4} \\ \frac{5}{8} \\ \hline \end{array}$ d) $\begin{array}{r} 4\frac{3}{4} \\ 2\frac{1}{2} \\ \hline \end{array}$

e) $\begin{array}{r} 4\frac{1}{8} \\ 3\frac{1}{4} \\ \hline \end{array}$ f) $\begin{array}{r} 3\frac{5}{8} \\ 2\frac{1}{4} \\ \hline \end{array}$

2. Convert the following into hours or parts of an hour:

a) 15 minutes b) 45 minutes c) 2 hours 20 minutes

d) 3 hours 40 minutes e) 1 hour 30 minutes

f) 12 minutes

3. Add:

a) 4 hrs. 15 min.
3 hrs. 30 min.

b) 2 hrs. 45 min.
1 hr. 30 min.

c) 3 hrs. 20 min.
4 hrs. 45 min

d) 40 min.
6 hrs. 40 min.

4. Complete the following time cards:

a)	A.M.		P.M.		Hours Worked
	In	Out	In	Out	
Mon.	7:30	11:30	12:00	5:00	
Tues.	7:30	11:30	12:00	5:00	
Wed.	8:00	12:00	12:30	4:30	
Thurs.	9:00	12:00	1:00	5:00	
Fri.	8:00	12:00	12:30	4:30	
Sat.	8:00	12:00	—	—	
Sun.	—	—	—	—	
Total Number of Hours Worked					

b)	A.M.		P.M.		Hours Worked
	In	Out	In	Out	
Mon.	8:00	11:30	12:00	4:30	
Tues.	8:00	12:00	12:30	3:30	
Wed.	7:30	11:30	12:00	4:00	
Thurs.	8:30	12:00	1:00	6:30	
Fri.	8:00	11:30	12:30	4:00	
Sat.	9:00	12:00	—	—	
Sun.	9:00	1:00	—	—	
Total Number of Hours Worked					

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 8/4 = 2; 2/4 = 1/2 b) 5/4 = 1 $\frac{1}{4}$; 1/4
c) 11/8 = 1 $\frac{3}{8}$; 1/8 d) 6 $\frac{5}{4}$ = 7 $\frac{1}{4}$; 2 $\frac{1}{4}$
e) 7 $\frac{3}{8}$; 7/8 f) 5 $\frac{7}{8}$; 1 $\frac{3}{8}$

2. a) 1/4 b) 3/4 c) 2 $\frac{1}{3}$ d) 3 $\frac{2}{3}$ e) 1 $\frac{1}{2}$
f) 1/5

3. a) 7 hrs. 45 min. b) 4 hrs. 15 min.
c) 8 hrs. 5 min. d) 7 hrs. 20 min.

4. a)			b)		
	Mon	9		Mon	8
	Tues	9		Tues	7
	Wed	8		Wed	8
	Thur	7		Thur	9
	Fri	8		Fri	7
	Sat	4		Sat	3
	Total	45		Sun	4
				Total	46

SUMMARY:

1. How do we convert time to hours and fractional parts of an hour?

2. How do we find the total number of hours worked from time cards?

CONSUMER MATHEMATICS
EARNING A LIVING
LESSON: 3

AIM: How can we convert annual salary to monthly and semi-monthly salary?

PERFORMANCE OBJECTIVES: The student will be able to...

1. State what is meant by annual salary, monthly salary, semi-monthly salary, gross pay and pay period.
2. Compute the quotient of a decimal by a whole number.
3. State and apply the following relationships:
   gross monthly pay = annual pay / 12
   semi-monthly pay = annual pay / 24

VOCABULARY: annual salary, monthly salary, semi-monthly salary, gross pay, pay period

MOTIVATION:

Irene and Jack graduated college and took jobs in the city. Irene is a computer programmer earning $30,000 a year. Jack is a manager earning $2400 a month. Who earns more money in a year, Irene or Jack?

DEVELOPMENT:

1. Using the motivation problem, ask "In order that we may compare Irene and Jack's salary, what must we do? Elicit: Convert Irene's salary to a monthly salary or convert Jack's salary to an annual salary.
   GROSS MONTHLY SALARY = GROSS ANNUAL SALARY / 12
   GROSS ANNUAL SALARY = GROSS MONTHLY SALARY x 12.
2. Do Application #1.
3. Ask, "How can we convert Jack's salary to semi-monthly salary?" Elicit: Divide monthly salary by 2. Ask, "How can we convert Irene's annual salary to semi-monthly salary?" Elicit: Divide annual salary by 24.

4. Do Application #2.

5. Review division of decimals by whole numbers.

6. Do Application #3.

APPLICATIONS:

1. a) Find the gross monthly salary if the annual salary is:
    1) $12,000
    2) $10,200
    3) $18,000
    4) $39,000

   b) Find the gross annual salary if the monthly salary is:
    1) $900
    2) $1375
    3) $2750
    4) $8000

2. a) Find the gross semi-monthly salary if the monthly salary is:
    1) $4000
    2) $6250
    3) $2796
    4) $1884

   b) Find the gross semi-monthly salary if the annual salary is:
    1) $48,000
    2) $13,800
    3) $14,520
    4) $22,008

3. a) Find the gross monthly salary if the annual salary is: (Round off if necessary.)
    1) $12,006
    2) $25,000

   b) Find the gross semi-monthly salary if the annual salary is: (Round off if necessary.)
    1) $28,000
    2) $50,004

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 1) $1000
   2) $850
   3) $1500
   4) $3250

   b) 1) $10,800
   2) $16,500
   3) $33,000
   4) $96,000

2. a) 1) $2000
   2) $3125
   3) $1398
   4) $942

   b) 1) $2000
   2) $575
   3) $605
   4) $917

3. a) 1) $1000.50 2) $2083.33

b) 1) $1166.67 2) $2083.50

SUMMARY:

1. What is meant by annual salary? Monthly salary? Semi-monthly salary? Gross pay?
2. How do we convert annual salary to monthly salary?
3. How do we convert annual salary to semi-monthly salary?

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 4

AIM: How can we convert annual salary to weekly and bi-weekly salary?

PERFORMANCE OBJECTIVES: The student will be able to...

1. State what is meant by annual salary, weekly salary, bi-weekly salary and pay period.
2. State and apply the following relationships:
   a) Weekly earnings = annual salary / 52.
   b) Bi-weekly earnings = annual salary / 26.

VOCABULARY: weekly salary, bi-weekly salary

MOTIVATION:

In the last lesson we learned that Irene earned $30,000 a year as a programmer. Ask, "What is her weekly salary?"

DEVELOPMENT:

1. Using the motivation problem, students should indicate that there are 52 weeks in a year. Ask, "How can we find the weekly salary given the annual salary?" Elicit:
   Gross weekly salary = gross annual salary / 52.
   Gross annual salary = gross weekly salary x 52.
2. Do Application #1.
3. Explain that some people are paid every two weeks (bi-weekly). Ask, "Given an annual salary, how can we find the bi-weekly salary?" Elicit:
   Gross bi-weekly salary = gross annual salary / 26.
   Gross annual salary = gross bi-weekly salary x 26.
   Ask, "Is bi-weekly salary the same as semi-monthly salary?" Elicit: No, as an example -
      If the annual salary = $24,000,
      then semi-monthly salary (÷ 24) = $1,000
      and bi-weekly salary (÷ 26) ≈ $923.

4. Do Application #2.

APPLICATIONS:

1. a) Find the weekly salary if the annual salary is:
    - 1) $39,000
    - 2) $26,000
    - 3) $40,000
    - 4) $14,000

   b) Find the annual salary if the weekly salary is:
    - 1) $600
    - 2) $410
    - 3) $315.25
    - 4) $220.50

2. a) Find the bi-weekly salary if the annual salary is:
    - 1) $52,000
    - 2) $32,500
    - 3) $16,000
    - 4) $22,500

   b) Find the annual salary if the bi-weekly salary is:
    - 1) $480
    - 2) $816
    - 3) $296.75
    - 4) $750.50

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 1) $750
    - 2) $500
    - 3) $769.23
    - 4) $269.23

   b) 1) $31,200
    - 2) $21,320
    - 3) $16,393
    - 4) $11,466

2. a) 1) $2000
    - 2) $1250
    - 3) $615.38
    - 4) $865.38

   b) 1) $12,480
    - 2) $21,216
    - 3) $7,715.50
    - 4) $19,513

SUMMARY:

1. What is meant by weekly salary?
2. What is meant by bi-weekly salary?
3. How do we convert annual salary to weekly salary?
4. How do we convert annual salary to bi-weekly salary?

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 5

AIM: How can the hourly rate for salaried employees be computed?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Divide decimals.
2. Find hourly rate given weekly salary using the relationship:
   Hourly rate = total weekly salary / total weekly hours.
3. Find weekly rate using the relationship:
   Weekly rate = total yearly salary / total weeks in the year.

VOCABULARY: hourly rate

MOTIVATION:

Arlene works after school and earns $4 per hour for every hour she works.
Tom works a 40 hour work week and earns $166 a week.
Ask, "How can we find out who earns more per hour?" Elicit: We need to know Tom's hourly wage.

DEVELOPMENT:

1. Using the motivation problem, students should develop the following relationship:
   Hourly rate = total weekly salary / total weekly hours.
   Therefore Tom's hourly wage is $4.15. Tom earns more per hour than Arlene.
2. Do Application #1.
3. Discuss the need to review division of decimals and rounding-off to the nearest cent. (Perhaps similar problems can be given in previous homework assignments.)
4. Do Application #2.

5. Ask, "How do we find the hourly wage if we are given the annual salary?" Elicit:
   Hourly rate = total annual salary / total weeks in the year / total weekly hours.

6. Do Application #3.

7. Refer back to the motivation problem and then do Application #4.

APPLICATIONS:

1. Find the hourly rate if the total weekly salary and the total weekly hours are respectively:
   a) $150; 25 hours
   b) $300; 40 hours
   c) $315; 35 hours

2. a) Round off each of the following to the nearest cent:
   1) $4.258
   2) $6.194
   3) $32.999
   4) $3.0549

   b) Divide and round-off to the nearest cent, if necessary.
   1) $180 / 16
   2) $400 / 18
   3) $30 / $2\frac{1}{2}$
   4) $30 / $4\frac{1}{2}$

3. Complete the following table:

Annual Salary	Weeks in Year	Weekly Hours	Hourly Rate
a) $10,400	52	25	
b) $31,200	52	40	
c) $18,750	52	35	

4. Which of the following two employees receives the greater hourly wage?
   Employee A: Earns $249 a week for 35 hours of work.
   Employee B: Earns $16,200 a year for a 35-hour work week.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) $6
   b) $7.50
   c) $9

2. a) 1) $4.26
        2) $6.19
        3) $33.00
        4) $3.05
    b) 1) $11.25
        2) $22.22
        3) $12
        4) $6.67

3. Hourly Rate
    a) $8.00
    b) $15.00
    c) $10.30

4. Employee A: $7.11
    Employee B: $8.90
    Answer: Employee B

SUMMARY:

1. Given the total weekly salary and hours, how do we compute an employee's hourly wage?
2. Given the total annual salary and the weekly hours, how do we compute an employee's hourly wage?

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 6

AIM: How can we compute earnings at a hourly rate?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Compute earnings when an employee is paid hourly.
2. State and apply the relationship:
   Regular earnings for a week = hourly rate of pay x hours worked weekly.
3. Determine the wages an employee paid on a hourly basis loses because of lateness.
4. Determine the actual weekly earnings if pay is lost because of lateness using the relationship:
   Regular weekly earnings - loss in wages = actual weekly earnings.

MOTIVATION:

Sheila works in a hospital. She is paid by the hour. If she is paid $4 per hour and she works a 40-hour week, ask: "How much does she earn each week?" Elicit: $160.

DEVELOPMENT:

1. Using the motivation problem, ask: "In order to compute weekly earnings, what facts must we know?" Elicit: Hourly rate of pay and hours worked weekly. (Be sure students have reviewed multiplication of decimals, perhaps given in previous homework assignments.)
2. Ask, "How do we compute Sheila's weekly earnings?" Elicit: Regular weekly earnings = hourly rate of pay x hours worked weekly.
3. Do Application #1.

4. Establish the fact that in some cases, if a person doesn't work due to illness or lateness, they are not paid. For example: At the hospital for each 15 minutes that Sheila is late, she loses a fractional part of her salary.
5. Do Application #2.
6. Establish:
   Regular weekly earnings - loss in wages = actual weekly earnings.
7. Do Application #3.

APPLICATIONS:

1. In each of the following cases determine the regular weekly earnings of a person whose hourly rate of pay and weekly hours worked are given:
   a) $6; 40 hours.
   b) $5; 35 hours.
   c) $7.50; 30 hours.
   d) $3.35; 35 hours.
   e) $4.75; 34 hours.
2. Calculate Sheila's daily pay for each day of the week and her weekly earnings if she worked the indicated hours and she was late as indicated. Her hourly rate is $5. She loses $\frac{1}{4}$ of her hourly rate for each 15 minutes late.

Monday	8 hours; 20 minutes late.
Tuesday	9 hours; 30 minutes late.
Wednesday	8 hours; On time.
Thursday	8 hours; 10 minutes late.
Friday	7 hours; 35 minutes late.

3. Given the following rules on lateness by an employer: For the first 10 minutes of lateness, no wages are subtracted. For each following 10-minute period of lateness and for any part of that period, 15 minutes worth of wages are subtracted. Enzio earns $5.40 per hour. One day Enzio was 35 minutes late.
   a) Determine the loss in wages due to lateness.
   b) Determine the actual weekly earnings for a 35-hour week.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) $240
   b) $175
   c) $225
   d) $117.25
   e) $161.50

2. Monday $40 - 1.25 = $38.75
   Tuesday $45 - 2.50 = $42.50
   Wednes. $40 - .00 = $40.00
   Thurs. $40 - .00 = $40.00
   Friday $35 - 2.50 = $32.50
   $200 - 6.25 = $193.75

3. a) 35 minutes - 10 minutes = 25 minutes
   25 minutes = 3 (10-minute periods.)
   Enzio loses 45 minutes pay. $\frac{3}{4}$ x $5.40 = $4.05
   b) 35 x $5.40 = $189
   $189 - $4.05 = $184.95

SUMMARY:

1. How do we compute weekly earnings at a hourly rate?
2. How do we account for lateness and/or illness in computing weeking earnings?

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 7

AIM: How do we compute a new yearly income if percent increase is known?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Convert percent to a decimal.
2. Find a percent of a number.
3. Compute amount of increase.
4. Compute new yearly increase if percent increase in known.

VOCABULARY: percent

MOTIVATION:

Greg has been working at his job for a year. One day his boss told him he was to get a 10% raise in his salary. Ask, "If Greg was earning $15,000 a year, what was the increase in his salary?" Elicit: 10% of his salary.

DEVELOPMENT:

1. Using the motivation problem, Ask: "How will we compute the increase in Greg's salary?" Elicit: compute 10% of $15,000. Review converting 10% into decimal form and multiplying $15,000 x .10 = $1500. (Perhaps review of converting % to decimal be given in previous homework assignments.)
2. Establish that in order to find the increase in salary multiply the old salary by the percent increase.
3. Do Application #1.
4. Ask, "Once we know the increase in salary how can we calculate the new yearly salary?" Elicit:
   New yearly salary = Old yearly salary + Increase
5. Do Application #2.
6. Do Application #3.

APPLICATIONS:

1. In each of the following calculate the increase in salary given the old salary and the percent increase.
   a) $18,000; 20%
   b) $20,000; 15%
   c) $16,500; 12%
   d) $25,000; 7%
   e) $40,000; $6\frac{1}{2}$%
2. Calculate the new yearly salary for each problem in Application #1.
3. a) Don's annual salary was $18,395 four years ago. His present salary shows an increase of 28%. What is Don's salary this year?
   b) Sarah's annual salary was $24,750 three years ago. Her present salary shows an increase of 33%. What is Sarah's salary this year?

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) $3600
   b) $3000
   c) $1980
   d) $1750
   e) $2600
2. a) $21,600
   b) $23,000
   c) $18,480
   d) $26,750
   e) $42,600
3. a) $23,545.60
   b) $32,917.50

SUMMARY:

1. How do we compute yearly increases in salary if percent increase is known?
2. How do we compute the new yearly salary if the percent increase is known?

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 8

AIM: How can tips affect one's gross income?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Multiply a fraction by a decimal.
2. Explain jobs where tips are received.
3. Define what is meant by gross income.
4. Find gross income given information as to how "tips" are earned.

VOCABULARY: tips, gross income

MOTIVATION:

Ask, "What do the following jobs have in common with respect to earning a living? - waiter, waitress, tax driver, barber, hairdresser, delivery person."

DEVELOPMENT:

1. Using the motivation problem, elicit that in general in each of these jobs, "tips" are an important part of the person's total wages. Define a "tip" as a sum of money voluntarily given to a person who usually performs a service. It is normally given in addition to a salary.
2. Nina is a waitress. She works a 5-day, 40-hour week. She earns \$3.25 a hour. Ask, "If Nina averages \$22 a day in tips, what is her average weekly salary?" Elicit: \$240. Define gross income as the sum of all monies earned. In this case Nina's gross weekly income is the sum of her weekly wages plus tips. (\$130 + \$110 = \$240)
3. Do Application #1.
4. Discuss the fact that in some jobs, tips may be earned based upon a formula or they may be shared by several people.

5. Do Application #2.
6. Do Application #3.

APPLICATIONS:

1. Find the gross weekly income:
   a) 4-day, 30-hour week, $3.50 per hour, $15.25 daily tips.
   b) 5-day, 40-hour week, $3.15 per hour, $19.75 daily tips.
   c) 3-day, 24-hour week, $4.10 per hour, $11.50 daily tips.
   d) 4-day, 32-hour week, $3.05 per hour, $17.80 daily tips.
2. Craig is a waiter who works a 5-day, 47-hour week earning $6.25 a hour. If his gross weekly income is $399.65, find his average daily tips.
3. Matty is a taxi driver. His wages are one-half of the total fares he collects. Tips average one-third of his total fares. His employer requires him to pay one-half of the gas bill for his cab. In one week Matty collected $588 in fares. The total gas bill was $62.50. Find his gross weekly income.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) $166.00
   b) $224.75
   c) $132.90
   d) $168.80
2. $21.18
3. $458.75

SUMMARY:

1. What is meant by "tips"?
2. What is meant by gross income?
3. How can tips affect one's gross income?

CONSUMER MATHEMATICS
EARNING A LIVING
LESSON: 9

AIM: How can overtime earnings at a hourly rate be computed?

PERFORMANCE OBJECTIVES: The student will be able to...

1. State the definition of overtime, time and one-half and double time.
2. Compute overtime wages using the relationships:
   a) Total hours worked - regular work week hours = overtime hours.
   b) Earnings for overtime = overtime hours worked x overtime rate.

VOCABULARY: overtime, time and one-half, double time

MOTIVATION:

Some employees are paid at a regular rate for a specified number of hours worked; any hours worked beyond this specific number is referred to as overtime. Ask, "What is meant by overtime?"

DEVELOPMENT:

1. Using the motivation problem, establish that overtime represents hours worked beyond a specified number of hours. Discuss the fact that some people are paid at a different hourly rate when they work overtime. This is usaually referred to as time and one-half or double time. Ask, "What are some jobs in which overtime is paid?" Elicit: salesman, factory worker, etc.
2. Judy Kay works as a waitress and is paid overtime if she works over 8 hours in any given day. (Overtime is calculated at one and one-half times the regular hourly wage.) Yesterday, Judy worked 9 hours. Ask, "If Judy's hourly wage is $6, how much did Judy earn in overtime pay?" Elicit: $\$6 \times 1\frac{1}{2} = \$9$.

3. Do Application #1.
4. Discuss the fact that some people are paid overtime after they have worked 35 hours in a week. Ray Vee works in a factory and is paid $7.50 a hour. Last week, Ray worked 42 hours. (Overtime is calculated at one and one-half times the regular hourly wage.) Ask, "What was Ray's overtime pay?" Elicit: $11.25 x 7 = $78.75.
5. Ask, "How do we compute overtime hours?" Elicit: Overtime hours = total hours worked - regular work week hours.
   Ask, "How do we calculate overtime earnings?" Elicit: Earnings for overtime = overtime hours worked x overtime rate.
6. Do Application #2.
7. Indicate that in some jobs, overtime rates may be different for Sundays and holidays. For example, in some jobs, overtime rates may be double time for holidays.
8. Do Application #3.
9. The teacher may wish to include applications using time cards.

APPLICATIONS:

1. Calculate the overtime pay given the number of overtime hours and the regular hourly rate of pay.
   (Overtime pay = $1\frac{1}{2}$ times the regular hourly rate.)
   a) 5; $8.
   b) 10; $11.
   c) 15; $6.50
   d) 12; $12.50

2. Complete the table below:
(Overtime pay = $1\frac{1}{2}$ times the regular hourly wage.)

	Total Hours	Regular Hours	Regular Rate	Overtime Hours	Overtime Rate	Overtime Wage
Tommy	40	35	$3.50			
Billy	41	35	$4.50			
Mary	39	35	$7.00			
Jon	47	40	$9.00			
Andrew	43	35	$6.50			

3. a) Calculate the overtime earnings for Judy Kay (See Development #2.) if she worked 8 overtime hours on Sunday at double time.

   b) Calculate the overtime earnings for Ray Vee (See Development #4.) if he worked the schedule listed below. (Regular work week is 35 hours, time and one-half for regular overtime and double time on Sunday.)

Monday	8 hours	Saturday	5 hours
Tuesday	8 hours	Sunday	4 hours
Wednesday	9 hours		
Thursday	8 hours		
Friday	8 hours		

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) $8 x $1\frac{1}{2}$ = $12; $12 x 5 = $60

   b) $11 x $1\frac{1}{2}$ = $16.50; $16.50 x 10 = $165

   c) $6.50 x $1\frac{1}{2}$ = $9.75; $9.75 x 15 = $146.25

   d) $12.50 x $1\frac{1}{2}$ = $18.75; $18.75 x 12 = $225

2.

	Overtime Hours	Overtime Rate	Overtime Wage
Tommy	5	$ 5.25	$26.25
Billy	6	$ 6.75	$40.50
Mary	4	$10.50	$42.00
Jon	7	$13.50	$94.50
Andrew	8	$ 9.75	$78.00

3. a) $6 x 2 = $12; $12 x 8 = $96

b) Total = 50 hours
- 35 regular hours
15 overtime hours
(11 regular overtime + 4 Sunday)

Regular overtime earnings = $11.25 x 11 = $123.75
Sunday overtime earnings = $15 x 4 = $ 60.00
$183.75

SUMMARY:

1. How do we compute the hourly rate for overtime?
2. How do we compute the overtime earnings given the hourly rate of pay?

CONSUMER MATHEMATICS
EARNING A LIVING
LESSON: 10

AIM: How can gross earnings involving overtime be computed?

PERFORMANCE OBJECTIVES: The student will be able to...

1. State the definition of gross earnings, regular time, overtime pay, time and one-half and double time.
2. Explain the procedure used to find the number of overtime hours worked and how to find the earnings for overtime.
3. Apply the relationships:
   a) Total hours worked - regular work week hours = overtime hours.
   b) Earnings for overtime = overtime hours x overtime rate.
4. Find the gross earnings involving overtime using the relationship:
   gross earnings = regular earnings + overtime earnings.

MOTIVATION:

Marion earns overtime pay at her job as a secretary using the following information:

Hourly rate = $9.00
Time and one-half after 35 hours per week
and double time on Sundays.

Given the following schedule, calculate her overtime earnings.

Monday	7 hours
Tuesday	$7\frac{1}{2}$ hours
Wednesday	$8\frac{1}{2}$ hours
Thursday	8 hours
Friday	$7\frac{1}{2}$ hours
Saturday	$5\frac{1}{2}$ hours
Sunday	5 hours

DEVELOPMENT:

1. Using the motivation problem, elicit:

   Total hours (Mon - Sat) = 44 hours
   44 - 35 = 9 overtime hours
   Regular overtime rate = $13.50 a hour
   Sunday overtime rate = $18.00 a hour

   Review - earnings for regular overtime = overtime hours x overtime rate = $121.50
   earnings for Sunday overtime = Sunday overtime hours x overtime rate = $90.00
   Total overtime earnings = $211.50

2. Ask, "How can we calculate Marion's gross earnings including overtime earnings?" Elicit:

   Gross earnings involving overtime = regular earnings + overtime earnings.

   Ask, "What is Marion's gross earnings?" Elicit:

   Regular earnings = 35 x $9 = $315.00
   Overtime earnings = $211.50
   Gross earnings = $526.50

3. Do Application #1.

4. Do Application #2.

APPLICATIONS:

1. Jenny earns $4.84 a hour. She earns time and one-half for hours worked beyond 38 each week. What will she earn during one 41-hour work week?

2. Complete the following table:

	Total Hours	Reg Hrs	Reg Rate	Regular Wage	O-T Hrs	O-T Rate	Overtime Earnings	Gross Earnings
Jim	42	40	$8.00					
Ann	44	35	$6.50					
Renee	39	35	$9.50					
Art	49	40	$7.40					
Sal	50	40	$8.20					
Pete	40	37.5	$5.00					

SOLUTIONS TO APPLICATION PROBLEMS:

1. 3 overtime hours
   overtime rate = $7.26
   overtime wages = $21.78
   gross earnings = $183.92 + $21.78 = $205.70

2.

	Regular Wage	Overtime Hours	Overtime Rate	Overtime Earnings	Gross Earnings
Jim	$320.00	2	$12.00	$ 24.00	$344.00
Ann	$227.00	9	$ 9.75	$ 87.75	$314.75
Renee	$332.50	4	$14.25	$ 57.00	$389.50
Art	$296.00	9	$11.10	$ 99.90	$395.90
Sal	$328.00	10	$12.30	$123.00	$451.00
Pete	$187.50	2.5	$ 7.50	$ 18.75	$206.25

SUMMARY:

How do we calculate gross earnings involving overtime?

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 11

AIM: How can total earnings be determined for employees paid straight commission?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Find a percent of a number.
2. Define commission.
3. Compute earnings when an employee is paid by commission.
4. Apply the relationship:
   a) Commission = rate of commission x total sales
   b) Commission = rate of commission per unit x amount sold.
5. Find the amount of commission if commission depends on total sales, fixed amount per unit or percent of sales.

VOCABULARY: commission, rate of commission, straight commission

MOTIVATION:

Mark works for a real estate agency. His salary is based totally on the sale of houses. Mark receives 7% on the selling price of each house he sells. Ask, "How much does Mark earn if he sells a house for $58,000?" Elicit: $4060.

DEVELOPMENT:

1. Using the motivation problem, review the conversion of percents to decimals and the multiplication of decimals. (Perhaps these skills can be reviewed in previous homework assignments.)
2. Do Application #1.
3. Describe some jobs where people are paid on the basis of the total sales and/or the number of items sold. Define commission as pay given based on a percentage of total sales or an amount given for each item sold. Define

straight commission as total wages received only from commission.

4. Ask, "How do we calculate one's commission?" Elicit:
   a) Commission = rate of commission x total sales.
   b) Commission = rate of commission per unit x amount sold.

5. Do Application #2.

6. Do Application #3.

APPLICATIONS:

1. Ken's class sold 315 boxes of candy in a fundraiser. If they made $2.50 commission on each box sold, find the total commission.

2. Esta works in a shoe store where she earns 18% commission on everything she sells. Last week Esta sold $875 worth of shoes. Calculate her earnings for the week.

3. Mr. Sarno is paid a 9% commission on sales. This week he sold 3 armchairs at $215 each, 4 end tables at $64.49 each and 3 loveseats at $479.95 each. Find his commission.

SOLUTIONS TO APPLICATION PROBLEMS:

1. 315 x $2.50 = $787.50

2. .18 x $875 = $157.50

3. 3 x $215 = $ 645.00
   4 x $64.49 = $ 257.96
   3 x $479.95 = $1439.85
   $2342.81
   .09 x $2342.81 = $210.85

SUMMARY:

1. What is meant by commission?

2. What is meant by straight commission?

3. How do we compute total earnings for employees paid straight commission?

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 12

AIM: How can we compute gross pay for employees paid salary and commission?

PERFORMANCE OBJECTIVES The student will be able to...

1. Define gross pay and commission.
2. Compute gross pay for employees paid salary and commission.
3. Apply the relationships:
   a) Commission = rate of commission x total sales (or amount of units, etc.).
   b) Total earnings = gross pay = salary + commission.

MOTIVATION:

Juan earns $350 a week at the electronics store. To stimulate sales, Juan's boss asks Juan to take less in salary and take a commission on what he sells. Ask, "Why do you think Juan should or should not change his salary arrangements?" Elicit: Depends on new salary, rate of commission and how much he sells.

DEVELOPMENT:

1. Using the motivation problem, discuss the advantages and disadvantages of the new arrangement. Ask, "Juan's new salary will be $200 a week and a 10% commission on sales. If Juan's average weekly sales have been $1600, which salary arrangement would be best?" Elicit: The new arrangement by $10.
2. Ask, "How do we calculate total earnings if a person is paid a salary and a commission? Elicit:
   Total earnings = gross pay = salary + commission.
3. Do Application #1.
4. Do Application #2.

5. Explain that sometimes commission is not based on total sales but only on a portion of it.

6. Do Application #3.

APPLICATIONS:

1. Ruthann earns money each summer selling encyclopedias. Her salary and rate of commission for the past three summers are indicated below. Compute her earnings for each summer and her total earnings for the past three summers.
   1st Summer (8 weeks)
   $100/week salary and 11% commission on $1500 total sales.
   2nd Summer (10 weeks)
   $120/week salary and 12% commission on $1800 total sales.
   3rd Summer (4 weeks)
   $150/week salary and 9% commission on $1000 total sales.

2. Juan earns $279.95 a week plus 19% commission on sales at his new job. Find his total earnings if he sold three stereos at $414.95 each, two dishwashers at $514.95 each and four TV's at $618.45 each.

3. Fred earns $400 a month plus 4% commission on sales over and above $2000. If Fred sold $4750 worth of merchandise, compute his monthly salary.

SOLUTIONS TO APPLICATION PROBLEMS:

1. 1st Summer - $965 Total Earnings = $3071
   2nd Summer - $1416
   3rd Summer - $690

2. Total sales = $4748.55
   .19 x $4748.55 = $902.22
   + $279.95
   $1182.17

$$\begin{array}{r} 3.\ \ .04 \times \$2750 = \$110 \\ \underline{+\ \$400} \\ \$510 \end{array}$$

SUMMARY:

How do we compute gross pay for employees paid salary and commission?

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 13

AIM: How can we compute gross pay for employees paid salary and graduated commission?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Explain what is meant by graduated commission and gross pay.
2. Add and multiply decimals
3. Compute gross pay for employees paid salary and graduated commission.

VOCABULARY: graduated commission

MOTIVATION:

Julio works for a hi-tech sales company. His boss has indicated that if Julio increases his sales, he will raise his commission. Ask: "What advantage will Julio have if he accepts this method of commission?" Elicit: Increased sales means increased rate of commission which means more earnings for the same amount of sales.

DEVELOPMENT:

1. Using the motivation problem, ask: "In January Julio sold $10,000 worth of equipment.
   a) Julio works on a 15% straight commission, find his earnings.
   b) Julio makes 12% commission on the first $4000 and 20% on anything above $4000, find his earnings.

   Elicit: a) $10,000 x .15 = $1500
   b) $4000 x .12 = $ 480
   $6000 x .20 = $1200
   $1680
2. Establish that graduated commission means the rate of commission increases as the amount of sales increases.

3. Review - Commission = rate of commission x total amount sold.
4. Do Application #1.
5. Total earnings involving commission = salary + commission.
6. Do Application #2.

APPLICATIONS:

1. Joel sells vacuums. He earns 10% on the first $300 of monthly sales, 12% on the next $400 and 20% on all sales in excess of $700. Joel sales were $2000. How much did he earn?
2. The salesmen at M. H. Racy and Co. earn $300 weekly salary plus commission based on the following schedule:
   5% on sales up to and including $1000.
   10% on sales over $1000 up to and including $2000.
   20% on sales over $2000.
   Find the gross pay for each of the employees given total sales.
   Employee A - $2000
   Employee B - $3000
   Employee C - $4875

SOLUTIONS TO APPLICATION PROBLEMS:

1. $ 300 x .10 = $ 30
   $ 400 x .12 = $ 48
   $\underline{\$1300}$ x .20 = $\underline{\$260}$
   $2000 $338
2. Employee A - $300 + $50 + $100 = $450
   Employee B - $300 + $50 + $100 + $200 = $650
   Employee C - $300 + $50 + $100 + $575 = $1025

SUMMARY:

1. What is meant by graduated commission?
2. How do we compute gross pay for employees paid salary and graduated commission?

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 14

AIM: How can earnings based on piece-work be determined?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Explain what is meant by earnings on a piece-rate basis.
2. Compute daily earnings when an employee is paid by the piece.
3. Compute weekly earnings when an employee is paid by the piece.
4. Find salaries by combining piece-work earnings and an hourly rate.

VOCABULARY: piecework, piece-rate basis

MOTIVATION:

Dennis receives an hourly wage for wiring TV components. In addition, he earns a bonus for each component over 120 that he wires. Ask: "What advantage does Dennis have by earning a bonus?" Elicit: An incentive to make as many components as he can to earn additional money.

DEVELOPMENT:

1. Using the motivation problem, define piecework as pay for the number of units/items completed or produced. Ask: "What jobs sometimes pay people for piecework completed?" Elicit: Making parts, typing pages, building things, cleaning rooms, sewing clothes, etc.
2. Using the motivation problem, determine how much piecework pay Dennis makes if he makes 141 components at 42¢ per component.
   Elicit: 141 - 120 = 21; 21 x .42 = $8.82
3. Do Application #1.

4. Some employees are paid an hourly salary and a bonus for piecework. Ask: "How can we calculate a person's salary combining piecework earnings and an hourly wage? Elicit: Total earnings = earnings from hourly wage + piecework earnings.

5. Do Application #2.

6. Do Application #3.

APPLICATIONS:

1. Compute the piecework earnings in the table below:

Item	Minimum # of items	Items Completed	Piecework Rate	Piecework Earnings
Typing	0	16 pages	$1/page	
Packing	10	35 packs	$.60/package	
Installing	5	12 items	$8/item	
Cleaning	0	15 items	$2.50/item	

2. a) Dennis (motivation problem) earns $4.35 an hour in addition to his bonus. If he works a 7-hour day, find his total earnings.

   b) Andrew does auto tune-ups in a garage. He earns $5.75 an hour and makes $20 to tune a 6-cylinder car and $30 to tune a 8-cylinder car. If last week, he worked 40 hours and tuned five 6-cylinder cars and four 8-cylinder cars, what was his total earnings?

3. Use the following table to solve the problems below.

COST PER TYPING PAGE

Size	Double Spaced	Single Spaced	Space and one half
Letter	$1.25	$2.50	$1.95
Legal	$2.10	$4.00	$3.15

Minimum charge is $6.50

What is the charge for:

a) Typing 18 pages, legal size, double spaced.

b) Typing 31 pages, letter size, single spaced.

c) Typing 3 pages, letter size, space and one half.

SOLUTIONS TO APPLICATION PROBLEMS:

1.

Typing	$16.00
Packing	$15.00
Installing	$56.00
Cleaning	$37.50

2. a) $30.45 + $8.82 = $39.27
   b) $230 + $100 + $120 = $450

3. a) $37.80
   b) $77.50
   c) $6.50

SUMMARY:

1. What is meant be piecework?
2. How do we compute earnings based on piecework?

CONSUMER MATHEMATICS
EARNING A LIVING
LESSON: 15

AIM: How can we find the amount withheld from gross pay for federal income taxes and for social security?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Explain what is meant be deductions, FICA and gross pay.
2. Compute federal income tax given a specific percentage.
3. Find the amount of social security tax for a given salary.
4. Explain what is meant by maximum taxable earnings.

VOCABULARY: deductions, taxes, FICA

MOTIVATION:

When Jack was hired he was told that his weekly salary would be $222. When Jack looked at his first pay check it said, "Pay to the Order of Jack Smith - $165.37. Ask: "What happened to the rest of Jack's money?"

DEVELOPMENT:

1. Using the motivation problem, Elicit: Certain deductions are taken from a person's salary. Ask: "What deductions may be taken form a person's salary?" Elicit: Federal, state and city income taxes, social security (FICA), savings, insurance, etc. (The teacher may wish to distribute sample copies of a pay check or use the overhead projector to show a sample check.)
2. Discuss why different deductions and varying amounts are deducted from different people's pay.
3. Discuss the use of specific tax tables used to calculate tax withheld and that this will be discussed at a different time. In this lesson explain that deductions will be based on a specific percentage of one's salary.

4. Ask: "What is meant by social security?" Elicit: A tax on income to pay for human social programs. Discuss the fact that the percentage of income deducted is set by the U.S. Congress. Ask: "If Mr. Stone earns $30,000 a year and FICA (Social Security) tax is set at 7%, calculate how much FICA tax Mr. Stone pays."
   Elicit: .07 x $30,000 = $2100.
   (It should be noted that there is a maximum FICA tax based on a salary fixed by the U.S. Congress. This is known as maximum taxable earnings.)

5. Do Application #1.

6. Do Application #2.

7. Do Application #3.

APPLICATIONS:

1. Determine the total deductions for each of the employees of the Alex Diner.

	Federal Tax	FICA	Total
H. Johnson	$378.95	$108.84	
Q. Ramada	$287.22	$ 73.91	
P. Holiday	$ 92.40	$ 56.30	
T. Quality	$103.65	$ 18.50	

2. In each of the following determine the federal tax and FICA tax withheld from salary and the total deductions.

Salary	Federal Tax	FICA	Total Deductions
$ 800	13%	7%	
$ 710	11%	7%	
$ 890	14%	$7\frac{1}{2}$%	
$1250	16%	$7\frac{1}{2}$%	

3. Compute the total deductions for each of the following given annual gross pay, percentage of federal tax and FICA tax.

Gross Pay	Federal Tax	FICA	Total Deductions
$36,000	12%	7%	
$24,000	10%	$7\frac{1}{4}$%	
$29,000	11%	$7\frac{1}{2}$%	

SOLUTIONS TO APPLICATION PROBLEMS:

1. H. Johnson	$487.79
Q. Ramada	$361.13
P. Holiday	$148.70
T. Quality	$122.15

2. $ 800 salary - $104.00 + $56.00 = $160
$ 710 salary - $ 78.10 + $49.70 = $127.80
$ 890 salary - $124.60 + $66.75 = $191.35
$1250 salary - $200.00 + $93.75 = $293.75

3. $36,000 salary - $4320 + $2520 = $6840
$24,000 salary - $2400 + $1740 = $4140
$29,000 salary - $3190 + $2175 = $5365

SUMMARY:

1. What is meant by deductions?
2. What is meant by gross pay?
3. How do we compute social security tax for a given salary?
4. How do we compute federal income tax for a given salary?

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 16

AIM: How can we find the total amount of deductions from gross pay?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Explain what deductions may be withheld from gross pay.
2. Find the total amount of deductions from gross pay.

MOTIVATION:

Remind students of Jack's pay check from the previous lesson. His weekly salary was $222, but his check amounted to only $165.37. Review with the students the income tax and FICA withheld from Jack's salary. Ask: "What other deductions may be taken from a person's salary which are required deductions?" Elicit: State and local income taxes, disability insurance, pension.

DEVELOPMENT:

1. Using the motivation problem the teacher will guide the students to different types of deductions. Ask: "What are voluntary deductions?" Elicit: Savings, health insurance, savings bond, contributions to charities, etc.
2. Do Application #1.
3. Do Application #2.
4. Review income tax and FICA deductions as a percent of salary.
5. Do Application #3.

APPLICATIONS:

1. Compute the total voluntary deductions for each employee.

	Life Ins.	Health Ins.	Savings	Contrib.	Total
Bill	$ .55	$ 5.50	$3.50	$.50	
Sarah	$1.25	$14.75	-----	----	
Randall	-----	$10.90	$4.00	$.75	
Andre	$ .65	$ 7.85	$2.95	----	
Carlos	$1.05	$ 6.95	-----	$.85	

2. Compute the total deductions for each employee.

	TAXES						
	Fed.	State	City	FICA	Ins.	Sav.	Total
Bob	$69.00	$13.00	$2.00	$45.48	$12.00	$10.00	
Joe	72.05	15.91	3.06	52.14	9.00	15.00	
Carl	39.75	8.51	1.80	32.96	-----	-----	
Dave	36.15	7.98	1.57	27.06	4.50	-----	
Art	93.00	16.86	4.10	60.19	20.00	20.00	
Flo	83.75	16.43	3.87	58.77	10.00	15.00	

3. Sandy has the following deductions taken from her salary of $300 a week.

Federal Income Tax	9% of her salary
State Income Tax	6% of her salary
City Income Tax	2% of her salary
FICA Tax	7% of her salary
Insurance	$ .50
Savings	$3.00
Contributions	$1.50
Pension (optional)	3% of her salary

a) What are Sandy's total required deductions?

b) What are Sandy's total voluntary deductions?

c) What are Sandy's total deductions?

SOLUTIONS TO APPLICATION PROBLEMS:

1.

Bill	$10.05
Sarah	$16.00
Randall	$15.65
Andre	$11.45
Carlos	$ 8.85

2.

Bob	$151.48
Joe	$167.16
Carl	$ 83.02
Dave	$ 77.26
Art	$214.15
Flo	$187.82

3.

a)	Fed. Tax	$27.00	b)	Insurance	$ .50
	State Tax	$18.00		Savings	$3.00
	City Tax	$ 6.00		Contributions	$1.50
	FICA	$21.00		Pension	$9.00
		$72.00		Voluntary	$14.00

c) Total deductions = $86.00

SUMMARY:

1. What is meant by required deductions?
2. What is meant by voluntary deductions?
3. How do we find the total amount of deductions from gross pay?

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 17

AIM: How can we compute the net pay given the total amount of deductions?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Define gross pay, deductions from pay and net pay.
2. Find net pay using the relationship:
   Net pay = gross earnings - total deductions.
3. Determine the amount of total deductions given the amount of gross pay and the amount of net pay.

MOTIVATION:

Leah's gross earnings each week amount to $460.85. Deductions total $125.09. Ask: "How much does Leah have after deductions?

DEVELOPMENT:

1. Using the motivation problem elicit: $335.76. Define gross pay, deductions from pay and net pay.
2. Ask: "In general, how do we find net pay?" Elicit:
   Net pay = gross earnings - total deductions.
3. Do Application #1.
4. Do Application #2.
5. Ask: "How can we compute total deductions given the gross pay and net pay?" Elicit:
   Total deductions = gross pay - net pay.
6. Do Application #3.

APPLICATIONS:

1. Compute the net pay for the employees whose gross earnings and total deductions are given.

	Gross Earnings	Total Deductions	Net Pay
A. B.	$378.95	$112.56	
C. D.	$247.80	$ 91.79	
E. F.	$315.00	$103.15	
G. H.	$285.75	$ 99.43	

2. Mark earns $78.35 each week, but $12.48 is taken out for deductions. What is Mark's weekly net pay?
3. Steve's gross earnings are $357.98 each week. His net pay is $294.17. What is the amount of Steve's weekly deductions?

SOLUTIONS TO APPLICATION PROBLEMS:

1. A. B. $266.39
   C. D. $156.01
   E. F. $211.85
   G. H. $186.32
2. $65.87
3. $63.81

SUMMARY:

1. What is meant by net pay?
2. How do we compute the net pay given the total amount of deductions?

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 18

AIM: How can we determine net pay given specific amounts for various deductions?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Compute amount of required deductions from pay.
2. Compute amount of voluntary deductions from pay.
3. Compute total deductions from pay given specific amounts withheld from salary.
4. Find net pay given various deductions withheld from salary.

MOTIVATION:

Ron has the following deductions made from his weekly salary.

Federal income tax	\$23.12
FICA	\$14.71
Savings	\$16.25

Ask: "What are his total deductions?" Elicit: \$54.08

DEVELOPMENT:

1. Using the motivation problem, review how to find total deductions given specific amounts for each deduction. Ask: "Now that we know the total deductions, how can we find Ron's weekly net pay?" Elicit: Net pay = gross pay - total deductions.
2. Do Application #1.
3. Do Application #2.
4. Review required deductions and voluntary deductions. Review finding a percent of a number.
5. Do Application #3.

APPLICATIONS:

1. Terry earns $189.56 a week. For Federal income taxes $22.89 is withheld. For State taxes $5.99 is withheld. For FICA taxes $11.42 is withheld. What is Terry's net pay after deductions?

2. Compute the total tax withholdings and the net pay for the following employees.

	Weekly Gross Earnings	Federal Tax	State Tax	FICA Tax	Total Withheld	Net Pay
Employee A	$103.29	$ 9.16	$2.58	$ 6.21		
Employee B	$225.00	$18.00	$5.76	$12.89		
Employee C	$147.43	$ 7.80	$1.97	$ 5.76		

3. Neal's weekly deductions are as follows:

Federal Income Tax	11% of his salary
State Income Tax	4% of his salary
FICA	6½% of his salary
Life Insurance	$ .75
Medical Insurance	$6.00
Loan Payment	1% of his salary
Charity Contributions	$1.25

If Neal's gross earnings are $400 a week, find his weekly net pay.

SOLUTIONS TO APPLICATION PROBLEMS:

1. $189.56 - $40.30 = $149.26

2. Employee A $17.95 withheld; net pay = $ 85.34
   Employee B $36.65 withheld; net pay = $188.35
   Employee C $15.53 withheld; net pay = $131.90

3. Federal Tax = $44.00
   State Tax = $16.00
   FICA = $26.00
   Loan = $ 4.00
   Total deductions = $98
   Net Pay = $400 - $98 = $302

SUMMARY:

1. How do we compute net pay given specific amounts for various deductions?

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 19

AIM: What is meant by the Consumer Price Index and how does it relate to earning a living?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Explain the Consumer Price Index.
2. Explain what is meant by buying power.
3. Explain how the Consumer Price Index is related to buying power.
4. Determine the buying power for a particular item given the Consumer Price Index.

VOCABULARY: Consumer Price Index, buying power

MOTIVATION:

Ask: "What do we call a continuing rise in prices, taxes and wages?" Elicit: Inflation.
Ask: "What does it mean to the wage earner?" Elicit: Even though one earns more, everything else rises (some proportionally) and you often don't feel you have more money to spend.

DEVELOPMENT:

1. Using the motivation questions, demonstrate:
   Rafael earned $8000 three years ago. Increases have increased his salary 30%. Ask, "What is Rafael's salary now?" Elicit: $10,400. Ask, "If prices have risen 40% in these three years, does Rafael have more or less money to spend?" Elicit: Less.
2. Show that buying power is determined by the Consumer Price Index (CPI). Define CPI as the measure of the costs of goods and services in a given year. The year 1967 is used as a base of comparison. In other words $1

bought goods and services worth $1. In 1973, $1 was worth only 75 cents and in 1976, it was worth 59 cents. For example, Rafael could buy 50 pieces of candy for $1 in 1967. Ask: "How many could he buy in 1973?" Elicit: 50 x .75 is approximately 38. Ask: "How many could he buy in 1976? Elicit: 50 x .59 is approximately 30.

3. Do Application #1.

4. Do Application #2.

3. Do Application #3.

APPLICATIONS:

1. Compute the effect that inflation had on each of the following.
   Use the CPI as follows - 1967 = 100 cents,
   1973 = 75 cents, 1976 = 59 cents.

NUMBER BOUGHT FOR $1 IN

	1967	1973	1976
a) Pens	15		
b) Clips	300		
c) Books	3		

2. a) In 1967, John could buy 4 cakes for $1. How many cakes could he buy in 1974 when $1 bought a $.68 value?
   b) Sam could buy 5 pencils for $1 in 1967. How many pencils could he buy in 1975 when $1 bought a $.62 value?

3. Julie could buy 5 plants in 1977 for a dollar. How many plants could she buy for a dollar in 1985 when $1 is worth $.38?

SOLUTIONS TO APPLICATION PROBLEMS:

1. a)	Pens	1973 - 11;	1976 - 9
b)	Clips	1973 - 225;	1976 - 177
c)	Books	1973 - 2;	1976 - 2

2. a) .68 x 4 is approximately 3
   b) .62 x 5 is approximately 3

3. .38 x 5 is approximately 2

SUMMARY:

1. What is meant be the Consumer Price Index?
2. What is meant by buying power?
3. How does the CPI relate to earning a living?

CONSUMER MATHEMATICS

EARNING A LIVING

LESSON: 20

AIM: How can we use information from classified ads to compute wages and compare jobs and make decisions on answering a classified ad?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Compare wages for various jobs using relationships given in the previous lessons.
2. Read classified ads to determine information necessary to compute wages for various jobs.
3. Read classified ads to determine information necessary to make decisions on answering an ad or taking a job.

VOCABULARY: classified ad

MOTIVATION:

Humberto graduated high school and wanted to find a job. Ask: "What could Humberto do to find out what jobs were available?" Elicit: Go to an agency, look in the paper, ask friends, look in the windows for signs, etc.

DEVELOPMENT:

1. Using the motivation problem, establish that the most common way to look for a job is to read the classified ads in the newspaper. Show students the classified section from the newspaper.
2. Present a sample ad such as:

CLAIMS ADJUSTOR
TRAINEE $14,000
4 year degree
Ability to deal with people and customer.
EASTRIDGE Personnel Service
4338 54th Street
555-8220

Ask: What information does this ad give a prospective wage earner?" Elicit: What the job is, salary, requirements for employment, name, address, and phone number of the agency. Ask: "What would be the weekly salary?" Elicit: $269.23. Ask: "Is there other information you would want to know about the job?" Elicit: Hours, benefits, vacation, etc. Ask: "How would you find out about these things?" Elicit: Call or visit the agency.

3. Do Application #1.
4. Indicate that not all ads are so descriptive.
5. Do Application #2.
6. Indicate that some ads, although descriptive are still vague.
7. Do Application #3.
8. Establish that sometimes you must make decisions about a job by comparing two or more ads.
9. Do Application #4.

APPLICATIONS:

1.

BANK TELLER
Position available for a full time commercial and savings teller. Recent exp. nec. Weekly salary $650. Downtown location. Full benefits + parking.
UNION BANK 555-7006

a) Where is the job located?
b) What is the salary?
c) What is meant by full benefits?
d) Is experience necessary?
e) How can you get more information?
f) What is the annual salary?

2.

DATA PROCESSING
COMPUTER PRGRS TO
$30,000 Box #333 City

a) What is the job?
b) What is the salary?
c) What other information is given?
d) How would you find out more about the job?
e) What is the weekly salary?

3.

DENTAL NURSE
Exp. only. Cert. req. Weekly salary
$700+ depending on qualifications.
Benefits. Call 555-5555

a) What is the salary?
b) What does "Exp. only" mean?
c) How would you find out more about the job?
d) What is the minimum annual salary?

4. Use the ad from development #2 and the following:

ADJUST
CLAIMS
$250/week. No exp. nec.
Call 555-5678

a) Assuming all the other factors are equal, which job pays more?
b) How would you determine which is the best job?

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) Downtown
   b) $650/week
   c) Probably health benefits, vacation, pension
   d) Yes
   e) Call 555-7006
   f) $33,800

2. a) Computer programmer
   b) $30,000/year
   c) Nothing
   d) Write Box #333
   e) $576.92

3. a) At least $700/week.
   b) Must have experience in order to apply.
   c) Call 555-5555
   d) $36,400

4. a) The first ad.
   b) Be interviewed and find out all the information on benefits, etc.

SUMMARY:

How do we use information from classified ads to compute wages and compare jobs?

CONSUMER MATHEMATICS

MANAGING MONEY

LESSON: 1

AIM: How do we budget family income?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify monthly income sources and expense items.
2. Determine the total monthly income, expenditures and total cash flow by subtracting total expenses from total income.
3. Identify fixed and flexible expenses.
4. Project future expenses.

VOCABULARY: budget, fixed expenses, variable (flexible) expenses, expenditures, surplus, deficit

MOTIVATION:

Suppose you wanted to buy a new radio which costs $175. If you earn $280 a month, have saved $127, but have monthly expenses totalling $243, determine whether or not you can afford it.

DEVELOPMENT:

If we add together what we have saved, $127, and what we have earned, $280, we get $407. Subtracting expenses of $243 leaves $164, or not yet enough to buy the radio.

Define Budget as "An organized plan for spending money." You must know how much money you take in and what you must spend it on.

Elicit and list income sources, such as: salary, investments, dividends, pension, disability payments, unemployment insurance, welfare, alimony, child care payments.

Elicit some monthly expenses. (Household: rent, telephone, gas, heating, electricity; Food; Transportation: gas, parking, repairs; Personal: clothing, pocket money; Entertainment; Debt: loan repayment; Savings.)

Ask, "What do you suppose are meant by "fixed" monthly expenses?" (Expenses that you must pay each month and which don't change much from month to month.)

Ask, "Which of the above are fixed monthly expenses? (Rent and loan repayment.) The rest are called "flexible" or "variable" monthly expenses.

Design a sample budget. Determine an amount for monthly income. (Note that we will consider only after-taxes net take-home income. Taxes will be taken up in another section.) Have them assume they work full-time and have their own apartment. List the various expense items and ask the class to fill in amounts for each. Compute the total monthly expenses by adding together all the expenses. Determine the net surplus or deficit by subtracting total expenses from net income.

Ask, "What do you think should be done with this amount?" (Possible answers should include: Save it for emergencies or long-term purchases, or spend it immediately.)

Ask, "How are unexpected expenses handled?" (By taking out of savings or by borrowing.)

"How can we prepare for future unexpected expenses?" (Project future expenses.)

APPLICATIONS:

1. List in separate columns the fixed and flexible expenses: rent, food, loan payment, clothing, carfare, movie money, telephone, doctor bill.
2. Determine the monthly expenses of the Adams family if they spend $437 on rent, $312 for food, $160 on gas and electric, $67 on entertainment and make $52 in loan repayments.
3. What is the net savings if Mrs. Bill's income is $1144 but her expenses total $967?

4. Ali earns $948 but spends on the following items: Rent $225, food $192, car payments $200, student loan $147, telephone $28, utilities $83, and entertainment $124. How should he adjust his budget?

5. The Vega family spent the following last month: $425 on food, $325 for rent, $65 on their car, $100 repaying the credit card company, $185 on clothing and $193 for medical expenses. Their monthly take home pay was $1835. Determine their net savings for the month.

SOLUTIONS TO APPLICATION PROBLEMS:

1.

FIXED	FLEXIBLE
rent	food
loan repayment	clothing
	carfare *
	movie money
	telephone *
	doctor bill

* might be considered as fixed.

2. Adding gives $1028.

3. Subtracting $967 from $1144 gives $177.

4. Adding the expenses gives $999. Subtracting this from $948 gives a deficit of $51. This might come out of telephone, entertainment or even food.

5. Adding the expenses gives $1293. Subtracting this from $1835 leaves $542 for savings.

SUMMARY:

How is a budget prepared?

CONSUMER MATHEMATICS

MANAGING MONEY

LESSON: 2

AIM: How do we determine net worth?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify assets and liabilities.
2. Determine net worth by subtracting the total liabilities from the total assets.

VOCABULARY: asset, liability

MOTIVATION:

How much are you really worth? What factors determine it?

DEVELOPMENT:

Elicit from the class what factors would go into determining what you are worth, such as: money in the bank, investments, major items owned, money owed to you, the cash value of a pension or life insurance policy , money you owe other people.

Define asset as "What you own." Define liability as "What you owe other people."

Have the class list the assets of a fictional family owning a house, car, stocks, personal belongings (furs and jewelry), and with a savings account. Add them together to determine the total assets. (See Application 1.)

List the liabilities. (Owing money on a credit card, a mortgage or a car loan.) Add them together to determine the total liability. (See Application 2.)

Determine the net worth by subtracting the total liability from the total assets. (See Application 4.)

Ask, "What would it tell you if your net worth decreased from month to month?" (You are living beyond your means.) "What are some things you could do about it?" (Spend less;

save more; work longer hours or take on a second job.)

APPLICATIONS:

1. List in separate columns the assets and liabilities: jewelry, automobile loan, savings doctor bills, automobile, investments.
2. The White family owns the following items: A car worth $6000, jewelry valued at $5250, furs worth $3000 and C. D.'s for $11,000. Determine their net assets.
3. Mr. Cohen owned the following: EZ Credit Company $3673, student loan $1235, doctor bills $621 and tennis lessons $355. What is his total liability?
4. Determine the net worth of Mr. and Mrs. Marino if they own a car worth $7000, jewelry worth $11,500, household furnishings valued at $12,000, have savings of $3250 and owe $2150 on a car loan and $765 to the credit card company.

SOLUTIONS TO APPLICATION PROBLEMS:

1.

ASSETS	LIABILITIES
jewelry	auto loan
savings	doctor bills
automobile	
investments	

2. Adding gives $25,250.
3. Adding gives $5884.
4. Adding the $7000, $11,500, $12,000 and $3250 gives assets of $33,750. The liabilities total $2915. Subtracting gives a net worth of $30,835.

SUMMARY:

What is an asset?
What is a liability?
How would you determine net worth?

CONSUMER MATHEMATICS
MANAGING MONEY
LESSON: 3

AIM: How do we read labels?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Determine the quantity contained in a package from its label.
2. State the number of ounces in a pound or quart.
3. Convert quantities to pounds, quarts or hundred-count by dividing by the appropriate factor.

VOCABULARY: ounce, cup, pint, quart, gallon, pound, hundred-count

MOTIVATION:

Which contains more, a 3 quart container or 72 ounces? A 3 pound package or 50 ounces? Are both ounce units the same?

DEVELOPMENT:

Ask, "How many ounces are there in a pound?" (16.) "How many ounces in a cup?" (8.) "What does each measure?" (Weight and volume of liquid. Students should not confuse the two.) Discuss the units of liquid measure-ounce, cup, pint, quart, gallon. List the conversions:

8 oz. = 1 cup
4 cups = 1 quart
4 quarts = 1 gallon

(Point out that 2 cups is 1 pint, so that 2 pints make 1 quart.)

Discuss the motivation problems: 3 quarts = 3 x 4 cups = 3 x 4 x 8 ozs, or 96 ounces. This is more than 72 ounces. 3 pounds = 3 x 16 ozs, or 48 ounces. This is less than 50 ounces.

To change from a smaller unit to a larger unit, we must divide. Thus, 8 ounces = 8/16 lbs, or 1/2 lb. In liquid measure, 3 quarts = 3/4 gallons. 2 ounces = 2/8 cups, or 1/4 cup. (See Application 2.)

Many quantities are given in hundred-count. Tissues, for example, may come in a box of 50. Another brand may contain 75. The first is 50/100, or 1/2 a hundred, the second is 75/100 or 3/4 a hundred. This idea will be useful when we discuss unit pricing and comparison shopping.
(See Application 6.)

APPLICATIONS:

1. How many ounces are there in five pounds?
2. How many pounds are there in 38 ounces?
3. How many cups are there in three quarts?
4. How many cups does a half-gallon (two quart) container of milk hold?
5. How many ounces are there in a 3 lb. can of oil?
6. What fraction of a hundred-count is forty paper plates?
7. How many pounds is a can of mushrooms which weighs 6.7 ozs.?

SOLUTIONS TO APPLICATION PROBLEMS:

1. 1 lb. = 8 oz. so 5 lbs. = 5 x 8 or 40 oz.
2. 38 oz. ÷ 16 oz. per lb. = 2.375 lbs. (or $2\frac{6}{16}$ which equals $2\frac{3}{8}$ lbs.)
3. 1 quart = 4 cups so 3 qts. = 3 x 4 = 12 cups.
4. 2 qts. = 2 x 4 = 8 cups.
5. 1 lb. = 16 oz. so 3 lb. = 3 x 16 or 48 oz.
6. 40 =40/100 of a hundred-count. (This may be reduced to $\frac{2}{5}$ but $\frac{40}{100}$ may be better for comparison purposes.)
7. 6.7 oz. is 6.7 / 16 = .41875 lbs.

SUMMARY:

How many ounces in a pound? What do pounds measure? What are the conversions for liquid measure? What is a hundred-count?

CONSUMER MATHEMATICS

MANAGING MONEY

LESSON: 4

AIM: What is comparison shopping?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Compute the unit price of an item sold by the ounce, pound, quart or number by dividing the actual price by the quantity in ounces, quarts, pounds or count.
2. Compute the total price of an item by multiplying the unit price by the weight or quantity.
3. Determine the best buy by comparing the unit prices of several comparable items.

VOCABULARY: unit price

MOTIVATION:

If four ounces of "Fishy" tuna fish sold for 58 cents, while "Chunky" sold four ounce cans for 62 cents, which is a better buy? What if "Tiny" tuna contains 5 ounces for 70 cents? Which is the best buy?

DEVELOPMENT:

In order to compare different sized containers, we must know what the cost of one unit of measure is for each brand. This is called the "unit price". If we know what four ounces cost, how would we compute what one ounce costs?

Example: Four ounces of "Fishy" cost $0.58. One ounce would cost .58/4 or .145. This is the unit price for "Fishy" tuna. What is the unit price of "Tiny"? $0.70/5 = .14, which is less than .145. Thus "Tiny" sells for less per ounce and is a better buy.

If we are given the unit price of an item, how would we determine the cost of a given quantity? For example, peaches sell for 47 cents per pound. How much do $2\frac{1}{4}$ pounds cost?

If we multiply what one pound costs by the number of pounds we want we will get the total cost. Thus, 47 x 2.25 gives us 1.0575 or $1.06 for the $2\frac{1}{4}$ pounds.
(See Application 2.)

APPLICATIONS:

1. What is the unit price of cooking oil which costs $1.67 for 32 ounces?
2. How much would you pay for $3\frac{1}{4}$ pounds of Hamburger meat which costs $1.28 per pound?
3. What is the unit price (cost for one piece) of chicken which costs $9.25 for 24 pieces?
4. Which is a better buy, a six-pack of soda which costs $2.70 or the eight-pack which costs $3.45?
5. Which is a better buy, a 6 oz. can of "Snappy" cat food which sells for 37¢ or "Brand X" which costs 35¢ for a $5\frac{1}{2}$ oz. can?
6. Which is the better buy, "Soft" tissues which cost $0.67 for a box of 80 sheets or "Squeezy" tissues which cost $0.73 for 90 sheets?

SOLUTIONS TO APPLICATION PROBLEMS:

1. $1.67 / 32 = $0.05.
2. $1.28 x 3.25 = $4.16.
3. $9.25 / 24 = $0.39.
4. $2.70 / 6 = $0.45, while $3.45 / 8 = $0.43. Thus the eight-pack is the better buy.

5. 37/6 = 6.17¢. 35/5.5 = 6.36¢. Thus, "Snappy" is the better buy.

6. $\$0.67 / \frac{80}{100} = \$0.8375$ for 100. $\$0.73 / \frac{90}{100} = \$0.811$ for 100. Thus, "Squeezy" is the better buy.

SUMMARY:

How do we compute the unit price of an item? How can we tell which is the best buy among several items? If we know the unit price, how do we determine what a known quantity will cost?

LESSON: 5

AIM: What is sales tax?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify sales tax rate, sales tax.
2. Convert % to a decimal.
3. Compute the amount of sales tax on an item by multiplying the price by the tax rate; from a sales tax chart.
4. Compute the total cost of an item by adding the sales tax to the total price.

VOCABULARY: sales tax rate, sales tax, price, total cost

MOTIVATION:

If a radio costs $89.90, how much do you guess you would have to pay for it? Is $100 enough to buy it?

DEVELOPMENT:

In New York City, the sales tax rate is $8\frac{1}{4}$%. This means that for every dollar an item costs, the seller must pay the city $8\frac{1}{4}$ cents. For an item costing $4, the seller must charge 4 x $8\frac{1}{4}$ additional, or 33 cents more, making the total cost to the buyer $4.33. (See Application 1.)

Suppose the item costs $12.38. How much is the sales tax? We must multiply the cost by the tax rate. The rate in per cent must first be converted to a decimal. For a rate of 6% we would change this to .06 and then multiply the 12.38 by it, giving .7428, or .75 as the tax.

We can now do the motivation problem. Ask, "In New York City, the tax on $89.90 would come to how much?" $89.90 x .0825 = $7.42. Adding, gives a total cost of $97.32. (See Application 2.)

Tax tables have been prepared for items costing less than

$1. By reading down the column, you can find the tax for the given amount. This can then be added to the tax on the dollar part. For example, using an 8% table, if an item costs $4.55, we read down the first column until we find .55. The tax on this is 4 cents. The tax on $4 is 4 x 8 cents, or 32 cents. 32 + 4 gives a total tax of 36 cents. (See Application 4.)

APPLICATIONS:

1. Express as a decimal the following tax rates:
   a) 12%
   b) 5%
   c) $6\frac{1}{2}\%$
   d) $3\frac{3}{4}\%$
2. The New Jersey sales tax rate is 6%.
   a) Express this as a decimal.
   b) Compute the sales tax on the purchase of a $15.28 shirt.
   c) Compute the selling price of the shirt.
3. How much do $32 running shoes cost if the tax rate is 8 1/4%?
4. Using the 8% tax table, what is the tax on an item costing:
   a) 82¢
   b) $3.82
   c) $5.46

8% SALES TAX TABLE

AMOUNT	TAX
.00--.12	.00
.13--.24	.01
.25--.37	.02
.38--.49	.03
.50--.62	.04
.63--.74	.05
.75--.87	.06
.88--.99	.07

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) .12 b) .05 c) .065 d) .0375

2. a) 6% = .06
   b) $15.28 x .06 = $0.92.
   c) $15.28 + $0.92 = $16.20.

3. $32 x .0825 = $2.64. $32 + $2.64 = $34.64.

4. a) 6¢
   b) 3 x 8 = 24¢. 25¢ + 6¢ = 30¢.
   c) 5 x 8 = 40¢. 40¢ + 3¢ = 43¢.

SUMMARY:

How do we compute the sales tax on an item? What is the total cost of an item?

CONSUMER MATHEMATICS

MANAGING MONEY

LESSON: 6

AIM: How do we shop from a catalog?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Read a sales catalog, for example: where is the index, where is the ordering information, etc.
2. Determine item numbers from a catalog.
3. Compute shipping and handling charges based on weight and destination.
4. Complete an order form.

VOCABULARY: catalog, index, destination, handling, shipping

MOTIVATION:

The "Sneers" catalog shows a great sale on video casette recorders. If you can't get there how would you order one?

DEVELOPMENT:

Ask, "How many of you have ever ordered anything over the telephone or through the mail?"
"What information did you have to supply?" List these on the board. Be sure to include: Catalog date, page, item description, item number, unit price, number wanted, where to send it.
"How was it determined how much you would be billed?" "Do salespeople ever make mistakes?"
Locate the section of a catalog containing ordering information. Determine what will be required to order the video casette recorder, such as item number, description, quantity, unit price, weight, destination, sales tax, shipping and handling charges, etc. Discuss how shipping and handling charges are computed, based on weight and destination. (See Application 1.)
Discuss how to use the catalog index to locate a specific

item. Fill in this information for the video casette recorder on the order form. (See Application 3.) Compute the sales tax.

APPLICATIONS:

ZONE	1	2	3
WEIGHT	UNDER 10 MI.	10-25 MI.	OVER 25 MI.
UNDER 2 lbs	1.90	2.00	2.20
2-4lb 15oz	2.10	2.50	3.00
5-14lb 15oz	2.50	3.50	5.00
OVER 15 lbs	3.50	6.00	8.00

1. Determine the shipping and handling charge for the following items: (Approximate the weights, use the above chart.)
   a) A small television set shipped 30 miles.
   b) A sweater sent 5 miles.
   c) A 100 lb. set of weights delivered 12 miles.
2. Sheila Jackson ordered three towels from a catalog. Their total price was $27.52. If the tax is 6% and shipping and handling is $3 how much must she enclose?
3. Page 25 of the June 1986 catalog lists the following: Item #356-1, blue pants, Item #356-4, grey pants. Complete the order form for one pair of blue and two pair of grey, each weighing 1 lb. 12 oz. and selling for $18.25 each. Include the shipping charge using the above table for Zone 2. Use 6% as the sales tax rate.

CATALOG DATE____________ PAGE____

ITEM NO.	QUANTITY	DESCRIPTION	SIZE	COLOR	PRICE FOR 1	TOTAL COST

SEND TO:________________

____

____

TOTAL________________

TAX________________

SHIPPING________________

TOTAL ENCLOSED________

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) Over 15 lbs, zone 3 gives $8.00
   b) Under 2 lbs, zone 1 gives $1.90
   c) Over 15 lbs, zone 2 gives $6.00

2. Six percent of $27.52 gives $1.66 as the tax. Adding these plus $3 shipping gives $32.18.

3.

CATALOG DATE 6/86 PAGE 25

ITEM NO.	QUANTITY	DESCRIPTION	SIZE	COLOR	PRICE FOR 1	TOTAL COST
356-1	1	PANTS	34W,33L	BlUE	$18.25	$18.25
356-4	2	PANTS	34W,33L	GREY	18.25	36.50

SEND TO: P. STEVENS
1313 MOCKINGBIRD LA.
WESTVILLE, ILL

TOTAL $54.75
TAX 3.29
SHIPPING 3.50
TOTAL ENCLOSED $61.54

SUMMARY:

What information is necessary to order form a catalog? Where would you find it?

LESSON: 7

AIM: How do we shop at sales?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify list price, sale price, rate of discount, discount amount.
2. Compute the discount in dollars. For example, a $50 coat is marked 15% off. How much is taken off?
3. Compute the selling price.
4. Determine the list price of a sale item.

VOCABULARY: list price, sales price, rate of discount, discount amount

MOTIVATION:

If $38 shoes are on sale at 25% off, how much do we save? How much do we really pay?

DEVELOPMENT:

What is meant by list price? What is meant by sale price?
Elicit: "The 'list price' is what an item originally sells for. The 'sales price' is what it costs on sale, after the discount (amount reduced) is subtracted."
(See Application 1.)

How are discounts expressed?
Elicit: Items are discounted in dollar amounts or in percent of list price.

How can we find the amount of discount?
Elicit: We determine the **'amount of discount'** by multiplying the list price by the rate of discount (changed to a decimal). When the rate is given as a fraction, we can either multiply the list price by it to determine the discount, or change the fraction to a decimal and then multiply. (See Application 2.)

How can we determine list price when given the sale price? Elicit and write on board: The list price = sale price + amount of discount.

How can we determine the amount of discount when it is given a percent of the list price?
Elicit: The amount of discount (when given as a percent of the list price) = Sale price ÷ rate of discount (as a decimal) (See Application 3.)

APPLICATIONS:

1. A model airplane is on sale at $20 off. Its list price is $62.75. What is its sale price?
2. a) A bookstore offers a 20% discount. If you purchase a book listing for $12.75, what is the discount in dollars?
   b) Shop-Well Supermarket is advertising 1/3 off on orange juice. If you buy a container originally selling for $1.69, what is the discount?
3. A sweater sells for $12.72 after a 20% discount is taken. What is its list price? How much is taken off?

SOLUTION TO APPLICATIONS:

1. $62.75 - 20.00 = $42.75
2. a) 20% = .20, multiplied by $12.75 gives $2.55.
   b) $\frac{1}{3}$ x 1.69 = 0.563 or $.57. As a decimal, $\frac{1}{3}$ = 0.333, x 1.69 = .563 or $.57.
3. The original price, less 20% of this price, leaves .80 of the price. This must equal $12.72. Dividing 12.72 by .80 gives $15.90 as the list price. The discount is then $15.90 - 12.72 or $3.18.

SUMMARY:

How do we compute sale price of an item? How do we compute the list price of an item?

CONSUMER MATHEMATICS

MANAGING MONEY

LESSON: 8

AIM: What is installment buying?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify down payment, finance charge.
2. Compute the finance charge and actual cost of a purchase.
3. Compare an installment purchase to a cash sale.
4. Determine the annual percentage rate (APR).

VOCABULARY: installment, down payment, finance charge, interest, term

MOTIVATION:

A new car costs $12,750. If you pay for it over a period of two years, approximately how much do you actually pay for it?

DEVELOPMENT:

List several guesses from the class. Announce "Today you will learn about installment buying÷ What affects the amount you actually pay for the car? Elicit: Financing the car affects the amount you actually pay. For example, at 15%, financing $10,000 over 2 years comes to $485 per month. This means you actually pay $11,640 + the $2,750 down, or $14,390.

Ask, "When you see the car you like, what must you do so the dealer knows you are serious about purchasing it?" Ask, "Do you pay the entire amount before the car is ready? Discuss "down payment" as a dollar amount and as a percent of the selling price.

Ask, "When your new car is ready, can you just drive it off?" "What must be done after you fill out the papers?" Elicit "Finish paying for it."

Ask, "How many of you have enough money to pay the entire amount?" "For those of use who can't, how would we 'finance' it?" Define "financing" as an arrangement for paying. What follows is based on dealer-financing, but could be applied to other types of loans.
In return for giving us the car before it is fully paid for, we must pay the dealer more than the price of the car. (By price of the car we are referring to the total cost, including all dealer charges and taxes, excluding finance charges.)
How can we determine what we actually must pay for the car?
Elicit: We must determine the finance charge.

How can we determine the finance charge?
Elicit: What you owe (the amount financed) is determined by subtracting the down payment from the price. (See Application 1.)

What factors must be considered to determine the monthly payment (installment)?
Elicit: To determine what the monthly payment ("installment") will be, we must know the annual percentage rate (APR) and we must decide how long we wish to take to repay it (the "term"). A table enables us to determine this. (See Application 2.)

How can we determine how much is actually paid?
Elicit: How much is actually paid is determined by multiplying the number of payments by the monthly payment.

How do we calculate the finance charge?
Elicit: Subtracting the amount financed from the amount actually paid gives the finance charge.

How could we have avoided paying the finance charge?
Elicit: Had we paid the entire amount at once, we would have avoided this charge! (See Application 3.)

If we know the finance charge, how can we determine the annual percentage rate if we're given the finance charge? **Elicit:** We can determine the annual percentage rate by using another table. We must first compute the finance charge per dollar financed by dividing the finance charge by the amount financed. Using the term enables us to read the APR. (See Application 4.)

APPLICATIONS:

1. The compact disk player you would love to buy is now selling for $175. How much would you have to finance if you put down 20%?
2. You still have to finance $450 for your new computer. If you wish to pay it over two years, and the APR is 15%, use the table to determine the monthly payments.

MONTHLY PAYMENTS PER $1 FINANCED

	NUMBER OF MONTHLY PAYMENTS		
APR	12	18	24
10%	.0879	.0605	.0461
12%	.0893	.0612	.0471
15%	.0903	.0624	.0485
18%	.0917	.0638	.0499

3. A T.V. costs $350. It can be purchased for $50 down and $27.50 a month for 12 months. How much more does it cost if you buy it on installments?
4. What is the APR in Problem 3?

SOLUTIONS TO APPLICATION PROBLEMS:

1. \$175 x .20 = \$35. \$175 - \$35 = \$140.
2. Reading down the 24 payments column, we see that at 15% the payment is .0485 per dollar financed. Multiplying this by \$450 gives \$21.83 per month for two years.
3. \$350 - \$50 = \$300 financed. \$27.50 x 12 = \$330. It costs \$30 more to buy it on installment.
4. The payment per dollar financed is \$27.50/\$300 or .0917. From the table, we see that for 12 months, this corresponds to an APR of 18%.

SUMMARY:

How do we determine the finance charge, actual cost and actual rate of financing an item?

CONSUMER MATHEMATICS

MANAGING MONEY

LESSON: 9

AIM: How do we use a charge account?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify previous balance, average daily balance, minimum payment, annual fee.
2. Compute the monthly finance charge by multiplying the average daily balance by the monthly interest rate.
3. Compute the balance at any time by adding the previous balance, purchases and finance charge and subtracting payments.

VOCABULARY: previous balance, average daily balance, finance charge, minimum payment

MOTIVATION:

Have the class examine a credit company statement and locate the following items: purchases, credits, payments, closing date, previous balance, finance charge balance (or average daily balance), finance charge, new purchases, new balance, minimum payment.

DEVELOPMENT:

Define the terms above.
How do we determine the new balance?
Elicit: To determine the new balance, adding the purchases and finance charge to the previous balance and subtracting payments and credits. (See Application 1.)
Discuss how to determine the minimum payment, by multiplying the amount due by a determined percentage or a table. (See Application 2.)
Ask, "What is meant by a finance charge?" Discuss a finance charge based on the outstanding balance. You multiply the

monthly percentage (annual percentage divided by 12) by the outstanding balance. Point out that if you pay the entire amount due by a specific date, some companies will "waive" (define) the finance charge. (See Application 3.)

Discuss a finance charge based on the "average daily balance".

How do we determine the average daily balance?

Elicit: To determine the average daily balance, add the balance on each day and divide by the number of days in the billing period. This can be done more easily by multiplying the balance by the number of days it remains that way. Each time it changes, compute the new balance and continue as before.

Compute the sum of these multiplied balances. Dividing by the number of days will give the average daily balance. This is then multiplied by the monthly rate as above. (See Application 4.)

Discuss annual fees charged by credit companies.

APPLICATIONS:

1. Determine Mr. Do's new balance if his previous balance was $135.28, he made purchases of $55, payments of $100 and was charged a $5.25 service charge.
2. If the balance due is $456.78, what minimum payment is due at 10%?
3. Phillip's balance with the "Friendly Credit Company" is $74.81. What is his finance charge at 20%?
4. Show how the average daily balance was computed for the following account:

CLOSING DATE: 5/25

DATE	PURCHASES	DATE	PAYMENTS
5/7	128.75	5/8	90.00
5/11	12.50		
5/22	354.11		
TOTALS	495.36		90.00

PREVIOUS BALANCE	NEW PURCH	PAYMENTS	AVERAGE DAILY BAL	FINANCE CHARGE	NEW BALANCE	MINIMUM PAYMENT
$92.27	$495.36	$90.00	$159.76	$2.67	500.30	$50.03

SOLUTIONS TO APPLICATION PROBLEMS:

1. $135.28 + 55 + 5.25 - 100 = $95.53
2. $456.78 x .10 = $45.678 or $45.68
3. The monthly rate is .20/12 or .0167. Multiplying this by $74.81 gives $1.25.
4.

DATE	TRANSACTION AMOUNT	BALANCE	NO. OF DAYS	TOTAL
4/25	+92.27	92.27	12	1107.24
5/7	+128.75	221.02	1	221.02
5/8	-90.00	131.02	3	393.06
5/11	+12.50	143.52	11	1578.72
5/22	+354.11	497.63	3	1492.89
5/25		TOTAL	30	4792.93

Dividing $4792.93 by 30 gives $159.76

SUMMARY:

How do we determine the finance charge? How do we determine the new balance?

CONSUMER MATHEMATICS
MANAGING MONEY
LESSON: 10

AIM: What is a saving account?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify deposits, withdrawals, interest.
2. Compute the savings account balance by adding deposits and interest to the previous balance and subtracting the withdrawals.
3. Explain money market accounts, time deposit accounts, CD's.

VOCABULARY: passbook, interest, time deposit, CD, early withdrawal penalty

MOTIVATION:

Examine Mrs. G's saving account passbook. Locate the account number, deposits, withdrawals, interest, and present balance.

GLORIA G 311-4-0

DATE	WITHDRAWAL	DEPOSIT	INTEREST	BALANCE	TELLER
May 5 86		22.31		22.31	AB
Jun 6 86		25.47		47.78	AB
Jun 15 86	25.00			22.78	AB
Jul 1 86			.34	23.12	KR
Jul 5 86		23.77		46.89	AB

DEVELOPMENT:

Explain what a "passbook" is. Discuss where the various items from the application problem can be found. Note: Interest will be discussed in the next lesson. See Application 1.

Ask the class, "How do you think the present balance is determined?" (By adding the balance to the deposits or withdrawals.) See Application 2.

Discuss high-interest money market accounts. Explain that the interest changes with market conditions and have risk associated with them.

Explain "time deposit" accounts, such as Certificates of Deposit (CD's). Point out that the money must remain on deposit for a specified amount of time to earn the specified interest. Discuss early-withdrawal penalities.

APPLICATIONS:

1. Determine the deposits, withdrawals, interest and present balance of this account:

DATE	WITHDRAWAL	DEPOSIT	INTEREST	BALANCE	TELLER
Feb 23 86		83.75		127.59	BR
Mar 1 86		75.00		202.59	AB
Mar 15 86	50.00			152.59	BR
Apr 1 86			2.29	154.88	KS
Apr 1 86		75.00		79.88	KS

2. Roberto had $358.67 in his savings account. He made deposits of $12, $85, and $37.52 and withdrew $150. If he earned $6.20 in interest this quarter, compute his new balance.

SOLUTIONS TO APPLICATION PROBLEMS:

1. The deposits were $83.75, 75.00 and 75.00. $50.00 was withdrawn. Interest was $2.29 and the present balance is $79.88.
2. Adding the deposits, interest, and opening balance, we get $499.39. Subtracting the withdrawal leaves us with $349.39, his new balance.

SUMMARY:

How is the balance of a savings account computed?

LESSON: 11

AIM: How do we read a checking account statement?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify terms found on a checking account statement.
2. Locate entries on a checking account statement.
3. Determine the present balance by adding the deposits to the previous balance and subtracting the paid checks, fees and service charges.

VOCABULARY: transaction, deposit, credit, debit, service charge, balance, cleared check, cancelled check

MOTIVATION:

Distribute a sample checking account statement or locate one in the textbook. Have the students determine where on the statement they can locate the checks which have been paid. Have them determine the present balance, according to the bank. Have them then locate the following: Previous balance, deposits, fees and service charges, account number, closing date, number of deposits, number of checks.

DEVELOPMENT:

What information must be included in a checking account statement?
Elicit and have students give the meaning of the terms: closing date, debit, credit, "cleared" checks, previous balance, present balance, fees and service charges. Have students tell the numbers in the locations on the statement for these items. (See Application 1.)
Have the class develop a fictional checking statement. Include closing date, previous balance, paid checks, deposits, fees and a service charge. Ask, "How would you

determine the new (present) balance?" Elicit: Add the total of the deposits to the previous balance. Have them add together the checks paid, fees and service charge.

Determine the present balance by subtracting this from the above calculation. (See Application 2.)

APPLICATIONS:

1. Determine from this checking account statement the following: opening balance; closing balance; total of checks paid; service charges; total credits; date of statement; account number.

ACCOUNT NUMBER: 312-7			CLOSING DATE: April 5, 1986	
CHECKS PAID			DEPOSITS	
3/15	303	102.57	3/16	150.00
3/16	304	92.11		
3/27	306	12.00		
TOTAL:	3	206.68	TOTAL: 1	150.00
SERVICE CHARGE 5.45				
BALANCE LAST STATEMENT:		$192.31		
PRESENT BALANCE:		$30.18		

2. What is the present balance for this checking account? Checks paid total $2406.84, deposits of $3199.22, a service charge of $4.60 and a previous balance of $927.63.

SOLUTIONS TO APPLICATION PROBLEMS:

1. The opening balance was $192.31, closing balance $30.18, $208.68 of checks cleared, there was a service charge of $5.45, the total of credits (deposits) was $150.00, the date of the statement was April 5 and the account number is 312-7.

2. Adding the service charge to the checks paid gives debits of $2411.44. Adding the deposits to the previous balance gives $4126.85. Subtracting the debits from this gives a balance of $1715.41.

SUMMARY:

What are the main elements of a checking account statement? How do we determine the present balance?

CONSUMER MATHEMATICS

MANAGING MONEY

LESSON: 12

AIM: How do we use a checking account?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify the information on a check, such as check number, amount, date, signature, payee.
2. Explain the terms "pay to cash", endorsement, post-dated.
3. Write a check.
4. Complete a deposit slip.
5. Enter credits and debits into a checkbook register.
6. Compute the checking balance.

VOCABULARY: payee, endorsement, register, post-date, "bounce", running balance

MOTIVATION:

Suppose your checkbook shows you have a balance of $99.99. If you make a deposit of $54.22 and write a check for $135.14, will this clear? What is your new balance?

DEVELOPMENT:

How do we know if a check will clear?
Explain the concept of a check. Show how to endorse it.
What are the similarities and difference between a check and ? Elicit: Some of these include: They can only be cashed by the person to whom they are issued, there is security if lost, you have a record of payment and the cancelled check, it is easy to spend more money than you have available, there are fees and service charges, you cannot always get to your money. Explain the phrase "pay to cash".
How can we tell how much money we have in our checking account at the present time? Distribute a copy of a checkbook register or locate one in the textbook. Show the class how to enter a deposit and where to put the balance.

Do the same for a check. Demostrate with the motivation problem. $99.99 + $54.22 = $154.21. Subtracting the check of $135.14 leaves a new balance of $19.07. (See Application 1.)

Distribute copies of a blank check and deposit slip or have the students copy them from the board or text. For the check, locate and identify the following: Name of account, account number, check number, date, payee (define as the party being paid), amount (in numerals and words), signature. Discuss each item. Have the students write a check to someone. (See Application 2.)

What information must be included on a deposit slip? For the deposit slip, locate and identify the following: Elicit: Name of account, account number, date, amount of deposit as cash or checks, total. Discuss each item. Have the class complete a deposit slip. (See Application 3.)

Discuss the concept of "insufficient funds", "uncollected funds", returning or "bouncing" a check, post-dating, automatic re-deposit endorsing.

APPLICATIONS:

1. Enter this information, in order, in the checkbook register.
   Compute the running balance:
   Balance on 8/2: $345.79;
   Checks written: #305, 8/6, $250 to Able Realty;
   #306, 8/15, $56.21 to Super Market;
   #307, 8/21, $27.21 to 1st Bank;
   #308, 9/3, $250 to Able Realty;
   Deposits: 8/15, $375.00; 8/29, $375
2. Write a check to your school's Student Organization for $2.50.
3. Complete a deposit slip for checks of $35.39 and 163.52, and 22.59 in cash.

SOLUTIONS TO APPLICATION PROBLEMS:

1.

	8/2				345.79
305	8/6	Able Realty	250.00		95.79
306	8/15	Super Market	56.21		39.58
	8/15	Deposit		375.00	414.58
307	8/21	1st Bank	27.21		387.37
	8/29	Deposit		375.00	762.37
308	9/3	Able Realty	250.00		512.37

2.

FIRST BANK June 25, 1986 No. 238

Pay to the
Order of STUDENT ORGANIZATION $2.50

$ TWO 50/100 Dollars

312-7

3.

NAME OF ACCOUNT

CASH	$22.59
CHECKS	35.39
	163.52
TOTAL	221.50

DATE 8/3/86
ACCOUNT NO. 312-7

SUMMARY:

What are the important items on a check? How do we determine the balance at any time?

CONSUMER MATHEMATICS

MANAGING MONEY

LESSON: 13

AIM: How do we reconcile our checking account?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify checks and deposits which have cleared; outstanding checks and deposits; service charges.
2. Determine the actual balance by subtracting the service charges from the checkbook balance.
3. Determine the outstanding check total.
4. Determine the outstanding deposit total.
5. Reconcile the account by adding the outstanding deposits total to the statement balance, subtracting the outstanding check total from this, and seeing if this matches the checkbook balance.

VOCABULARY: reconcile, outstanding (check or deposit), adjusted balance

MOTIVATION:

When we receive our checking account statement, the balance shown does not match the balance of our checkbook register. It shows we have much more money than we thought! Could this be true? (No.) Why did this happen? (Checks were written and deposits made after the statement was drawn up.) Did the bank make a mistake? (Of course not!) What should we do with this money? (It does not really exist. The checkbook register shows the actual up-to-date balance.)

DEVELOPMENT:

Distribute a blank balance sheet or have the students copy one from their textbook. What information is needed on a balance sheet? Elicit and have them locate the following: Statement balance, outstanding checks, outstanding deposits, service charges, adjusted balance. (See Application 1.)

How can we determine our actual balance? Elicit: This is done by entering into our checkbook register and subtracing from the balance any fees and service charges.
(See Application 2.)

Discuss the concept of outstanding checks. Elicit "checks which have not yet been paid by the bank." Ask, "What do you think an outstanding deposit is?" (Deposits which have not yet been credited to your account.)

We must now "reconcile" our account. Explain to the class that this means seeing that our records agree with the bank's. In order to do this, we must determine which checks and deposits have not yet been credited. We make a separate list of these and add up the outstanding checks and outstanding deposits. We add the outstanding deposits to our statement balance. From this we subtract the total of the unpaid checks. This is our adjusted balance.
(See Application 3.)

This amount should agree with the new balance shown in the register. If it does, our account is reconciled and the balance shown is what the bank has. Ask, "If it is not, what must we do?" (Locate the error.) "If it is in our mathematics, we simply correct it. What if the diference is due to a disagreement with the bank's figures?" (Discuss it with the bank.)

Discuss the problems caused by forgetting to write in a check or deposit: Incorrect balance, possibly leading to later checks "bouncing"; being unable to reconcile the account.

APPLICATIONS:

1. List the statement balance, outstanding checks, outstanding deposits and current balance:

DEPOSITS MADE AFTER CLOSING		CHECKS NOT YET PAID	
4/15	102.54	4/13	277.51
5/ 1	27.71	4/21	32.19
		5/ 2	111.28
TOTAL	130.25	TOTAL	420.98

BALANCE SHOWN ON STATEMENT	824.49
ADD OUTSTANDING DEPOSITS	130.25
SUBTOTAL	954.74
SUBTRACT OUTSTANDING CHECKS	420.98
NEW BALANCE (SHOULD AGREE WITH CHECKBOOK REGISTER)	533.76

2. Our checkbook register shows a balance of $35.77 but our statement shows a service charge of $2.50 and fees of $3.00. What is our actual balance?

3. Mr Jacob's checkbook shows a balance of $521.94. If his statement shows a closing balance of $776.95, a total of $304.22 in outstanding checks, $42.21 in outstanding deposits and a service charge of $7, reconcile his account.

SOLUTIONS TO APPLICATION PROBLEMS:

1. Statement Balance: $824.49
   Checks: $277.51, 32.19, 111.28
   Deposits: $102.54, 27.71
   Current Balance: $533.76

2. $35.77 - 2.50 = 33.27. Subtracting $3.00 gives $30.27 as the actual balance.

3.

CHECKBOOK	STATEMENT	
$521.94	Closing bal.	$776.95
- 7.00	Outstanding dep.	42.21
$514.94	Subtotal	819.16
	Outstanding checks	304.22
	Total	$514.94

SUMMARY:

How do we determine our actual checking account balance?
How do we reconcile our checking account?

CONSUMER MATHEMATICS
MANAGING MONEY
LESSON: 14

AIM: What is simple interest?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Explain how money makes money.
2. Explain the difference between interest and principal; interest and interest rates.
3. Identify time periods.

VOCABULARY: interest, principal, interest rate

MOTIVATION:

Mr. Goldstein deposits $3000 in the bank. He forgets about it and leaves it there for five years. When he tries to get it out they want to give him more than his $3000! Why? How much do they want to give him? What must you know to determine this?

DEVELOPMENT:

Ask the class for guesses as to how much Mr. Goldstein will get. The correct answer, at the current rate (this term will be explained) is $4200, or $1200 more than he gave them! This is due to the bank paying him "interest".

Explain that interest is money paid to you by a bank for allowing them the use of the money. This is, of course, in addition to repaying you the full amount or any desired part of it, which you have left on deposit. The amount they pay you is computed in a number of ways. Today's lesson will only discuss "simple" interest.

There are several factors involved in determining how much they should pay you for the use of your money. Ask the class, "What determines how much interest you are paid?" List these on the board, including: How long they use your money; how much you give them; what rate they are paying.

Explain that different banks give different rates for the use of the same amount of money for the same amount of time. Under certain conditions, the same bank may not give the same rate it gave previously. A discussion of market conditions could be held here.

How can we calculate simple interest? The above mentioned factors can be combined into the "Simple Interest Formula," I = P x r x T, where I stands for interest accumulated, P is the principal, or the amount of money you leave on deposit, r is the rate of interest the bank gives you, and T is the length of time, in years, which they have your money.

We can now solve the motivation problem. We will assume an interest rate of 8% (.08), which is the rate some banks are now giving. "What is the principal, P?" ($3000) "What is the time period, T?" (5) Substituting into I = P x r x T gives I = (3000)(.08)(5) = 1200. The total amount returned is then 3000 + 1200 or $4200. See Application 1.

How do we compute the interest when the time period is less than one year? Since there are twelve months in a year, each month is 1/12 of a year. Thus, the time period for 5 months, for example, is 5/12. See Applications 2 and 3.

APPLICATIONS:

1. Compute the interest on $8000 at $6\frac{3}{4}$% for:
   a) 2 years
   b) 7 years
   c) 10 years
2. What is T, the time period, for:
   a) 3 years
   b) 3 months
   c) 4 years 6 months
   d) 2 years 5 months
3. $400 is left in the bank for 3 years 9 months. How much will it earn at 7%?

SOLUTIONS TO APPLICATION PROBLEMS:

1. $I = PrT$
   a) $I = (8000)(.0675)(2) = \$1080$
   b) $I = (8000)(.0675)(7) = \$3780$
   c) $I = (8000)(.0675)(10) = \$5400$

2. a) $T = 3$
   b) $T = 3/12 = 1/4$ or $.25$
   c) $T = 4 + 6/12 = 4\frac{1}{2}$ or 4.5
   d) $T = 2 + 5/12 = 2\frac{5}{12}$ or 2.41667

3. $I = PrT$, $T = 3 + \frac{9}{12} = 3.75$
   $I = (400)(.07)(3.75) = \$105$

SUMMARY:

What is interest? How do we compute simple interest?

CONSUMER MATHEMATICS

MANAGING MONEY

LESSON: 15

AIM: What is compound interest?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Explain compound interest.
2. Identify n, the number of time periods. For example, if a bank compounds quarterly, how many time periods is 7 years?
3. Determine i, the interest rate per period. For example, determine i for an annual rate of $11\frac{1}{4}$%, compounded quarterly.
4. Explain daily compounding.

VOCABULARY: compound interest, compounding

MOTIVATION:

If Mr. Carmelli put $5000 in the bank, how much would he get back after 1 year, at an annual rate of 6% simple interest? After 3 years?

DEVELOPMENT:

Have students solve the motivation problem by using the Simple Interest Formula, I = P x r x T. This gives the interest as (5000)(.06)(1) or $300. Added to the original $5000 gives him $5300. After 3 years, his interest would have come to (5000)(.06)(3) = $900, giving him a total of $5900.

Ask, "What would the interest be if the bank computed the interest every year based on the amount currently on deposit, rather than the amount he began with?" After the first year he would have earned (5000)(.06)(1) or $300. The amount now on deposit would be $5300. Using this amount as the new principal gives his interest for the second year as (5300)(.06)(1) or $318, $18 more than by simple interest!

His new amount would be 5300 + 318 or $5618. This is the principal for the third-year interest. (5618)(.06)(1) gives $337.08. Together with the $5618 we get $5955.08 as his new balance. His interest for the three year period is 955.08, $55 more than he would have gotten by simple interest.

Computing interest on the amount plus interest is called "compounding". Using this method, your money grows faster than by simple interest, which is based only on the original amount. The interest earned this way is called "compound interest". See Application 1.

Often banks compound more frequently than once a year. If the money is compounded four times a year, or once every quarter-year, it is said to be compounded quarterly. In this way, money on deposit for 3 years will be compounded twelve times after the three years. (3 years, 4 times a year.) This is called the number of time periods, n.

The rate at each compounding, however, will not be the annual rate. The annual rate is divided by the number of times the money is compounded during the year. Thus, at 6% compounded quarterly, each quarter the rate is 1.5%. (6%/4 = 1.5%) This is called the interest rate per period, i. Ask, "What do you think compounded daily means?" (The annual rate is divided by 365 and the interest computed for the amount on deposit each day!) See Application 2.

The interest earned on Mr. Carmelli's $5000 after one year, compounded quarterly, would be more than if it was compounded annually. Determining the actual amount of interest using this method is very cumbersome. An easier method of computation will be discussed in the next lesson.

APPLICATIONS:

1. Compute the interest earned on $1500 after 2 years at 7%, compounded annually.

2. Determine the interest rate per period and the number of periods for the following:
   - a) 8% compounded annually for 4 years.
   - b) 6% compounded quarterly for 3 years.
   - c) 5% compounded quarterly for 2 years 9 months.
   - d) 7% compounded semi-annually for 5 years.
   - e) 6% compounded daily for 2 years 5 months.

SOLUTIONS TO APPLICATION PROBLEMS:

1. $I = PrT = (1500)(.07)(1) = \$105$. After the first year, $A = 1500 + 105 = \$1605$. $I = (1605)(.07)(1) = 112.35$. $A = 1605 + 112.35 = 1717.35$. The total interest was then $1717.35 - 1500$ or \$217.35.

2. a) $i = .08/1 = .08$, $n = 4(1) = 4$

   b) $i = .06/4 = .015$, $n = 3(4) = 12$

   c) $i = .05/4 = .0125$, $n = (2 + \frac{9}{12})(4) = (2.75)(4) = 11$

   d) $i = .07/2 = .035$, $n = 5(2) = 10$

   e) $i = .06/365 = .0001643$, $n = (2\frac{5}{12})(365) = (2.41667)(365) = 882.0833$

SUMMARY:

What is compound interest?

CONSUMER MATHEMATICS

MANAGING MONEY

LESSON: 16

AIM: How do we use interest formulas?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Compute simple interest form the formula I = PrT.
2. Compute the amount accumulated from A = P+I.
3. Compute the amount accumulated with compound interest from the formula $A = P(1+i)^n$, where n is the number of time periods, i is the interest rate per period.
4. Compute the interest after compounding by I = A-P.

VOCABULARY: accumulated

MOTIVATION:

Mr. Smartt leaves $5000 in a bank account for one year at 6%, compounded quarterly. What is the rate per period, how many times is it compounded, and how much is it worth at the end of the year?

DEVELOPMENT:

Tell the class, "In a previous lesson, we were told that money grows faster if it is compounded, than it would under simple interest. Today we will see how."

Ask, "How much was $5000 worth if left for one year at 6%, using simple interest?" The interest was previously computed to be $300 using the simple interest formula I = P x r x T or I = Prt. The total amount becomes $5000 + $300, or $5300. This amount is known as the amount "accumulated", A = P + I. See Application 1.

Ask, "If the interest is compounded quarterly, how many times is it compounded during this period?" (4) Ask, "What is the rate per period?" (1.5%) See Application 2.

Ask, "How much interest is earned after the first period?"

($5000 at 1.5% for 1 period gives $75 as the interest.) The amount is now $5075. After the next period we have I = 5075 x .015 x 1 or $76.125 as the interest. Our new amount is $5151.13, to the nearest cent. Using this figure for the next period we get 5151.13 x .015 x 1 or $77.27. This gives an amount of $5228.40. Compounding again gives $78.43 for a total of $5306.83. Notice that it is $6.83 more than if simple interest had been used.

This is a very cumbersome way to compute the amount accumulated. A formula has been developed to do this much easier. It is $A = P(1 + i)^n$. To use it, we simply substitute the principal for P, the interest rate per period for i, and the number of periods for n.

The example just solved becomes:

$A = 5000\ (1 + .015)^4$

$= 5000\ (1.015)^4$

$= 5000\ (1.0613634)$

$= 5306.817$, or $5306.82. (The difference is due to rounding off in the above problem.) Point out to the class the order of operations--within the parentheses, the exponent, then the multiplication. This method is much easier, especially if the money is kept on deposit for several years! See Application 3.

APPLICATIONS:

1. How much is accumulated if $2500 earns $440 over two years?
2. If money is left in a bank for 5 years, determine i and n if the annual rate is 7% and it is compounded:
   a) quarterly
   b) annually
   c) semi-annually
3. How much will Merylee accumulate if she leaves $30,000 in the bank for 3 years at 8%, compounded quarterly?

SOLUTIONS TO APPLICATION PROBLEMS:

1. $A = P + I = 2500 + 440 = \$2940$

2. a) The rate per period is .07/4 or .0175, $n = 4 \times 5$ or 20 periods.
   b) $r = .07/1 = .07$, $n = 1 \times 5$ or 5.
   c) $r = .07/2 = .035$, $n = 2 \times 5$ or 10.

3. $P = 30000$; $i = .08/4 = .02$; $n = 4 \times 3 = 12$.
   $A = P(1 + i)^n = 30000(1 + .02)^{12} = 30000(1.02)^{12} =$
   $30000(1.2682) = \$38{,}046$.

SUMMARY:

What are the formulas for simple and compound interest?

LESSON: 17

AIM: How do we use interest tables?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Read an interest table.
2. Interpolate between two values.
3. Compute simple and compound interest from a table.
4. Determine the time needed to accumulate a required amount using an interest table. For example, how long would it take \$200 to become \$300 at 8% interest, compounded quarterly?

VOCABULARY: interpolation

MOTIVATION:

Compute the amount accumulated if \$120 is compounded quarterly for 3 years at an annual rate of 8%.

DEVELOPMENT:

Using the compound interest formula, with $n = 12$ and $i = .02$, we get $A = 120(1 + .02)^{12}$ or $A = (120)(1.2682) =$ \$152.18. While this method is easier than repeatedly using the simple interest formula, it is still very complicated. Wouldn't it be nice if there were an even easier method?

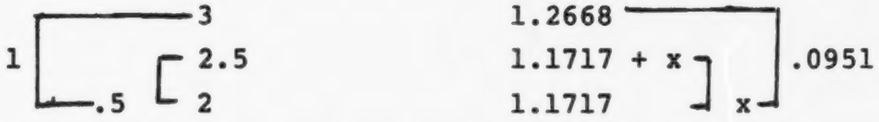
There is! Tables have been prepared which list the interest under different conditions. Today we will see how to use them.

Locate in the text, project using an overhead projector or distribute a compound interest table. Ask, "What do the columns and rows represent?" (Number of periods and rate per period.)

Solve the motivation problem using the table. Locate the column for 2% and read down to 12 periods. The number listed is 1.2682. This is the amount $1 would become under these conditions. For our $120 we would thus earn (120)(1.2682) or $152.18, as before. (See Application 1.)

Ask, "What would $1 become if the annual rate was 10%, compounded quarterly for two years?" The number of periods is 8. The rate per period is 2.5%, which we see is not listed in the table. It appears we cannot compute the interest using a table. We can, however, use a number between the values for 2% and 3%. This method is called "interpolation". While it does not give exact values, it is a very good approximation.

To interpolate, we call the number we are looking for the lower number plus x. We then compute the difference between the values we have and the values we are looking for.



We can now form a proportion and solve for x: x/.0951 = .5/1. This gives .04755 for x. Adding this to the 1.1717, we get 1.21925 as the interpolated amount for 2.5%. See Application 2.

Tables have been computed to solve simple interest problems as well.

If we know the interest, we can determine the other quantities by using the interest formulas or tables. If we want $200 to become $300, and we know the bank is giving 8% compounded quarterly, we can determine how long we must leave it on deposit. The new amount divided by $200 gives us what $1 would become! 300/200 = 1.5. Also, i = .02. Looking under the 2% column, we find this value occurs closest to 20 periods. Thus, the $200 will grow to $300 after 20/4 or 5 years. See Application 3.

APPLICATIONS:

1. Using the table, compute how much Mr. Smartt's $5000 will be worth after one year at 8%, compounded quarterly.

2. What will $1 become after 2 years at 9% compounded quarterly?

3. How long would it take for Mr. Carmelli's $5000 to grow to $6000, at 8%, compounded semi-annually?

SOLUTIONS TO APPLICATION PROBLEMS:

1. (5000)(1.0824) = $5412

2. i = .09/4 = .0225, n = 2(4) = 8
For n = 8, at 2% we get 1.1717. For 3% we get 1.2668.

$$\begin{array}{ll|ll} & .03 & 1.2668 & \\ .01 & .0225 & 1.1717 + x & .0951 \\ .0025 & .02 & 1.1717 & x \end{array}$$

x/.0951 = .0025/.01 or x = .02378. Adding this to 1.1717 gives $1.1955.

3. With i = .08/2 = .04, we find 6000/5000 = 1.2 closest to n = 5.

SUMMARY:

Name two methods of computing interest.

CONSUMER MATHEMATICS

MANAGING MONEY

LESSON: 18

AIM: How do we compute the effective interest rate?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Explain nominal interest rate, N, and effective interest rate, E.
2. Determine the effective interest rate from the formula $E = (1+N/n)^n - 1$

VOCABULARY: nominal, effective

MOTIVATION:

Eighth National Bank gives depositors 15 3/4% interest, compounded quarterly. Ninth National Bank gives 16%, compounded semi-annually. Which sounds like the better deal? How could you tell which bank gives you a better return on your money?

DEVELOPMENT:

Have the class determine the amount they would accumulate after one year if they deposited \$10,000 in each bank. Since $A = P(1 + i)^n$, at $15\frac{3}{4}\%$ quarterly we get $A = 10000(1 + .039375)^4 = 10000(1.1670)$ or \$11,670. At 16% semi-annually, $A = 10000(1 + .08)^2 = 10000(1.1664)$ or \$11,664. Thus, $15\frac{3}{4}\%$, actually gives the better return! In this case, the lower nominal rate (stated before compounding) gives the better return. Is this always true? How can we tell the best actual rate without having to go through the calculations? By establishing a standard, the effective interest rate, we can compare various rates. This is defined as the rate you actually get, after compounding for one year.

To compute this rate, a formula has been determined. The effective rate, E, is determined by $E = (1 + N/n)^n - 1$, where N is the nominal interest rate and n is the number of periods. In the above example, $15\frac{3}{4}$% compounded quarterly is equivalent to $(1 + .1575/4)^4 - 1 = (1 + .039375)^4 - 1 = 1.1670 - 1$, or an effective rate of 16.70%. See Application 1. 16% semi-annually gives $E = (1 + .16/2)^2 - 1 = (1.08)^2 - 1 = 1.1664 - 1$, or an equivalent rate of 16.64%. Thus we see that, in this case, the lower rate gives a higher equivalent rate. See Application 2.

APPLICATIONS:

1. Compute the effective rate of 10% compounded quarterly.
2. Which is a better deal, 6% compounded quarterly or 7% semi-annually?

SOLUTIONS TO APPLICATIONS:

1. $N = .10$, $n = 4$. $E = (1 + .10/4)^4 - 1 = (1.025)^4 - 1 = 1.1038 - 1 = .1038$, or an effective rate of 10.38%.
2. 6% quarterly gives $E = (1 + .06/4)^4 - 1 = (1.015)^4 - 1 = 1.06136 - 1 = .06136$. 7% semi-annually gives $E = (1 + .07/2)^2 - 1 = (1.035)^2 - 1 = 1.07123 - 1 = .07123$. Thus the effective rate of 7.123% is better than that of 6.136%.

SUMMARY:

Why do we need to know the effective interest rate?

CONSUMER MATHEMATICS

MANAGING MONEY

LESSON: 19

AIM: What are savings bonds?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify savings bond, T-bill.
2. Explain terms associated with savings bonds.
3. Compute the total interest from interest = face value - selling price.
4. Compute the current yield from annual interest / current price.

VOCABULARY: T-bill, yield, maturity, face value, par value, exempt, redeem, roll-over

MOTIVATION:

While savings accounts offer relatively "safe" investments, there are other means of increasing your savings. Have the class list some of these with their advantages and disadvantages.

DEVELOPMENT:

Elicit a discussion of investments, including stocks, bonds, CD's, savings bonds, T-bills. Point out the relative rates of return and the risks of each. Mention which are tax exempt (taxes do not have to be paid on the earnings) and which have penalties for early withdrawal.

Have the class define the terms used in discussing bonds-redeemed (cashed in); maturity (when it can be redeemed for its full value); redemption value (cost plus interest when cashed in); face value (what it is worth at maturity); par value (same as face value); yield (yearly interest divided by current value).

Ask, "How would you determine the total interest you will receive if you cash in at maturity a bond with a face value of $1000 which cost you $750?" Elicit that interest = face value - selling price. See Application 1.

Ask, "Would you expect to receive the face value if you cashed it in before maturity?" Discuss Redemption Value tables.

"How could we determine the annual yield on a $1000 bond currently worth $625, which pays $64 interest for the year?" Since the annual yield is the annual interest divided by the current price, the yield for this bond is 64/625 = .1024, or 10.24%. See Application 2.

Mention that if an investor does not want to redeem the bond at maturity, he may roll it over (reinvest the total amount). This allows the investment to further grow, until the money is needed.

APPLICATIONS:

1. A $10,000 bond sells for $7,300 and matures in 3 years. What is the total interest after maturity?
2. A $500 bond has a market price of $325 and offers $25 a year interest. What is the current yield?

SOLUTIONS TO APPLICATION PROBLEMS:

1. 10000 - 7300 = $2700
2. 25/325 = .076923, or 7.6923%

SUMMARY:

Why are bonds good investments? What are their negative features?

CONSUMER MATHEMATICS
MANAGING MONEY
LESSON: 20

AIM: What is a retirement plan?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify social security, FICA, Investment Retirement Account (I.R.A.).
2. Compute the amount accumulated and average annual income after a given number of years.
3. Determine the annual retirement benefit.

VOCABULARY: retirement, benefit, annuity, lump sum, pension

MOTIVATION:

When a person receives a paycheck, approximately 7% of his earnings are taken out for Federal Insurance Contribution Act (FICA). If you earned $22,000 last year, over $1500 was taken out for FICA. What is this amount used for?

DEVELOPMENT:

Define retirement as no longer working full-time. Define benefit as the amount a person receives from a retirement plan.

Ask, "How do people provide for themselves when they no longer receive income from working?" Responses should include our social security system, which will provide us with retirement income. Benefits in addition to social security can be gotten through: Private pension plans, where a company on its own, or by adding to periodic worker contributions, will provide a retirement income; Keough or Individual Retirement Accounts (I.R.A.'s) which will further supplement retirement income; real estate sale, where a large house which is no longer needed provides retirement income.

In many plans, benefits can be paid all at once, in a "lump sum", or as an "annuity", paid out over many years, providing an income. The tax liability of each case must be carefully considered.

Elicit: "How does the Government determine the amount of Social Security each person receives?" Elicit: To determine the income from a system such as social security, we must first determine the average income on which social security was paid during the person's career. This is done by adding up all the contributions paid into the system and dividing by the number of years. (Since there is a limit to how much social security can take out each year, this will not always be as much as was actually earned.) Tables have been prepared to determine the benefit paid to the worker and his dependants when he retires, based on this average annual income. See Application 1.

Most people supplement their social security income. Why is a retirement account useful? Elicit: A retirement account serves several purposes. It not only provides retirement income, but it is "tax deferred", which means that the money put in is not subject to income tax in the year in which it is earned. It is taxed when it is withdrawn, at retirement, when most people's income taxes are much lower. If, however, it is withdrawn earlier than allowed, there are substantial "early withdrawal penalties".

To determine how much accumulates, we use the compound interest formula on each amount deposited. That is, if $2000 is deposited each year for 30 years, the interest after the first year is based only on the first $2000. After the next year, we must consider the original $2000 plus interest, plus the next $2000 deposited. This process is continued every year. Fortunately, formulas have been developed and tables prepared to simplify the computation. See Application 2.

Private pension plans are usually based on the number of years worked and the final year's salary. This is why many people work as many hours as they can during the year in which they will retire. It is possible to reach a point where a person will earn as much if he retires as he would if he kept working!

APPLICATIONS:

1. Dexter is 64 years old and has worked since he was 26. He will be retiring after earning $298,235 in eligible wages.
   a) What is his average annual FICA income?
   b) What will his monthly benefits be?

Monthly Social Security Retirement Benefits

Average Annual Income	Benefit For Worker, Retirement at Age				Benefit per Dependant	Maximum Family Benefit
	65	64	63	62		
4000	296	277	257	237	148	506
6000	388	362	337	311	194	712
8000	483	451	418	386	241	845
10000	535	499	464	428	267	936

2. $2000 is deposited every December 31 into an IRA. Using compound interest formulas, determine how much accumulates after 5 years, at 10% annually.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 64 - 26 = 38 years. 298,235/38 = $7848.29.
   b) Using the table, we get a monthly benefit of $451 for himself and $241 for his wife (approximately). This gives a total monthly benefit of $692.

2. After the first year, we have $2000. After year 2, this grows to $2000(1.10)^1 = 2200$. Adding another 2000 gives $4200. After year 3, this becomes $4200(1.10)^1 = 4620$. Adding 2000 gives 6620. After year 4 we have $6620(1.10)^1 = 7282$. Adding 2000 gives 9282. After year 5 we get $9282(1.10)^1 = 10210.20$. Adding the final 2000 gives $12,210.20.

SUMMARY:

What are some of the ways in which people prepare for their retirement?

CONSUMER MATHEMATICS

LEISURE .

LESSON: 1

AIM: What are the costs of purchasing a new automobile?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Compute the sticker price of a new car.
2. Compute the dealer's cost of a new car.

VOCABULARY: base price, sticker price, destination charge, sticker price, dealer's cost, standard equipment

MOTIVATION:

Ernie and Bert have competitive Chevrolet dealerships. Ernie advertises a brand new Chevy Camaro for $8630 while Burt advertises it for $11,900.

What questions would you ask to account for the difference in price?

DEVELOPMENT:

1. Ask the students to read the questions they have written from the motivational exercise. Elicit:
   a) To compare prices for the same car we have to know what equipment is included in each for that price.
   b) What are the additional charges for optional equipment?
   c) Are there any other additional charges? For example destination charges.
2. When we examine the car in the showroom how can we determine what equipment is standard and what equipment is optional? Elicit: Each new car has a sticker on the window.
3. Distribute a sample sticker.
4. Ask, "What information can we determine from the sticker? Elicit: a) We can find the base price including which equipment is standard.

b) We can find the optional equipment added and their prices.

c) We can find the destination charge.

5. Ask, "How do we determine the sticker price?" Elicit: Sticker Price = Base Price + Options + Destination Charge.

6. Have students do Application #1.

7. Ask, "How much should we pay for the new car?" Elicit: Automobile dealers pay less than the prices on the sticker for the basic automobile and the options.

8. Point out that Consumer Magazines report the dealer's cost as a percent of the sticker price.

9. Ask, "How do we compute the dealer's cost? Elicit:
   Dealer's Cost = Percent of Base Price + Percent of Options Price + Destination Charge

10. Have students do Application #2.

11. Ask, "Do you think an offer of $10,000.00 is a reasonable offer to make to the dealer?" Why? Elicit:
    a) The offer is above the dealer's cost and considerably lower than the sticker price.
    b) The offer may be acceptable to the dealer depending on several factors, i.e. supply and demand, profit margin, etc.

APPLICATIONS:

CODE	DESCRIPTION	LIST PRICE
SC3M	CRANUS-XT 2DR CPE	9637.20
M43	METALLIC RED LUSTRE	0.00
B5W	BENCH SEATS-VINYL	0.00
D41	AUTOMATIC TRANSMISSION	480.00
G79	TIRES-G78-15 WHITE WALLS	110.00
F3S	POWER STEERING	0.00
V63	TINTED GLASS	72.60
L3C	AIR-CONDITIONING	612.40
F11	255 CID V6-2BBL	76.65
PS5	AM-FM STEREO CASSETTE	592.45
605	DESTINATION CHARGES	179.50

1. Compute the price of the options and the sticker price.
2. Compute the dealer's cost if a Consumer Magazine reports that the dealer's cost is 80% of the base price and 75% of the options price.
3. Joshua Crowe is considering the purchase of a recreational van. He sees one with a base price of $9350 and options totaling $2430. The destination charge is $320. He estimates the dealer's cost is 84% of the base price and 78% of the price of the options. If Joshua offers the dealer $250 over the estimated dealer's cost, what is his offer?

SOLUTIONS TO APPLICATIONS PROBLEMS:

1. Sticker Price = Base Price + Options + Destination Charges
                 = 9637.20 + 1944.10 + 179.50
                 = $11,760.60

   The sticker price is $11,760.80.

2. Find the percent of the Base Price.
   1) 80% of $9637.20 .... $7709.76
   2) Find the percent of Options Price.
      75% of $1944.10 .... $1458.08
   3) Find the Destination Charge .... $ 179.50
   4) Find the Dealer's Cost
      Percent of Base Price + Percent of Options Price + Destination Charges
      7709.76 + 1458.08 + 179.50 = $9347.34

3. Find the percent of the Base Price.
   1) 84% of $9350 .... $ 7854.00
   2) Find the percent of Options Price
      78% of $2430 .... + 1895.40
   3) Find the Destination Charge .... + 320.00
   4) Find the Dealer's Cost $10,069.40
   5) $250 over Dealer's Cost .... + 250.00
   6) Joshua's offer $10,319.40

SUMMARY:

1. Ask, "How do we compute the sticker price of a new car?"
2. Ask, "How would we estimate a reasonable offer to pay an automobile dealer for a new car?"

CONSUMER MATHEMATICS

LEISURE

LESSON: 2

AIM: How much should you pay for a used car?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Read a used-car guide to determine:
   a) Average retail value.
   b) Additional options.
   c) Options deductions.
   d) Mileage deductions.
2. Compute the average retail price of a used automobile.

VOCABULARY: average retail price, AT, PS, AC, V8, V6

MOTIVATION:

You are very interested in buying a used Hercules Bertini Coupe, model J29, that is advertised for $4195. It has an AM/FM stereo/tape deck, air-conditioning, manual transmission, turbine wheels, a sky roof, and has been driven for 78,000 miles.

How would you decide whether the dealer is asking a fair price for this automobile?

DEVELOPMENT:

1. Ask the students to read their responses to the motivational exercise. You might expect among others these responses:
   a) The price should depend on the mechanical and body condition of the automobile.
   b) The price should depend on the original selling price of the automobile.
   c) I would decide by checking to see what prices the same model automobile has been sold for recently.
2. Ask, "How would you check the prices that this automobile has been sold for recently?"

Elicit: I would look in the newspaper to compare the advertised price of this car similarly equipped.

3. Ask, "How do the advertised prices of automobiles compare to the actual selling price?"
Elicit: Automobile dealers usually advertise used cars for prices higher than what they expect you to pay.

4. Tell the students that used-car guides are published monthly which give the average prices cars were sold for the previous month.

5. Distribute sample of a page of a used-car guide.

AV'G TRADE-IN		BODY TYPE	MODEL	AV'G LOAN	AV'G RETAIL
HERCULES - BERTINI - V8-AT-PS-AC					
3025	3	H'dtp 2Dr	J29	2800	3650
3125	3	Coupe	J29	2900	3725
3200	3	Sed 4Dr	J29	2925	3750
100		Add Sky Roof		125	150
75		Add Vinyl Roof		100	125
75		Add Power Seats		100	125
50		Add Power Windows		75	100
50		Add Turbine Wheels		75	100
75		Add AM/FM Stereo		100	125
100		Add AM/FM Ster/Tape		125	150
175		Deduct Manual Transmission		175	175
225		Deduct W/O Air Cond.		225	225
300		Deduct High Mileage (Over 70,000, miles.)		300	300

6. Ask, "Using this guide how would we determine the Average Retail Price of the automobile advertised? Elicit:

Average Retail Price = Average Retail Value + Additional Options - Options Deduction - Mileage Deduction

7. Model with the students the solution of Application #1.

8. Ask, "Would you be willing to pay the advertised price for this automobile?" Why?
Elicit: No. I would expect to have the price lowered to nearer the Average Retail Price.

9. Have students do Application #2.

10. Have students do Application #3.

APPLICATIONS:

1. Compute the average retail price of the Hercules Bertini Coupe described in the advertisement.

2. Keisha Small would like to buy a 3 year old Cobra-ZX with 62,000 miles. She has determined the following from the used car guide: Average retail value is $7350, add $125 for AM/FM stereo radio, add $250 for air-conditioning, deduct $90 for manual transmission, mileage deduction $300. What is the average retail price she should keep in mind when she considers buying this automobile?

3. Use the price guide to find the average retail value and the average retail price of the Hercules Bertini described. Hard top 2 Door, Vinyl Roof, Power Seats, Power Windows, Power Steering, Manual Transmission, No Air-Conditioning, 60K miles.

SOLUTIONS TO APPLICATION PROBLEMS:

1. 1. Find the Average Retail Value $3725
   2. Find the Additional Options.
      AM/FM Stereo/Tape 150
      Turbine Wheels 100
      Sky Roof 150
   3. Find the Options Deduction.
      No Automatic Transmission 175
   4. Find the Mileage Deduction 300
   . Find the Average Retail Price.

AVERAGE RETAIL VALUE	+ ADDITIONAL OPTIONS	- OPTIONS DEDUCTION	- MILEAGE DEDUCTION	
$3725	+ $400	- $175	- $300	= $3650

2. 1. Find the Average Retail Value $7350
   2. Find the Additional Options.
      AM/FM Stereo Radio 125
      Air Conditioning 250

3. Find the Options Deduction.

Manual Transmission 90

4. Mileage Deduction 300

5. Find the Average Retail Price.

AVERAGE RETAIL VALUE + ADDITIONAL OPTIONS - OPTIONS DEDUCTION - MILEAGE DEDUCTION

$7350 + $375 - $90 - $300 = $7335

3. 1. Find the Average Retail Value $3650

2. Find the Additional Options.

Vinyl Roof 125

Power Windows 100

Power Seats 125

3. Find the Options Deduction.

Manual Transmission 175

No Air-Cond. 225

4. Mileage Deduction 0

5. Find the Average Retail Price.

AVERAGE RETAIL VALUE + ADDITIONAL OPTIONS - OPTIONS DEDUCTION - MILEAGE DEDUCTION

$3650 + $350 - $400 - $0 = $3600

SUMMARY:

Your mother tells you she would like to sell her car. She asks you for your help in determining what price she should ask for the car. What advice will you give her?

CONSUMER MATHEMATICS

LEISURE

LESSON: 3

AIM: What automobile insurance is necessary to protect yourself from financial losses?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Use tables to determine rates for:
   a) Property damage limits.
   b) Bodily injury limits.
   c) Comprehensive.
   d) Collision with deductible.
2. Compute the annual premium for automobile insurance.

VOCABULARY: bodily injury coverage, property damage coverage, annual premium, base premium, driver-rating factor, comprehensive, collision, deductibles, actuary

MOTIVATION:

You are driving your automobile with your friend and hit a patch of ice causing you to skid into your neighbor's front lawn. Your car is brought to a stop by a tree which falls onto the house.

What expenses might you anticipate?

DEVELOPMENT:

1. Ask the students for their responses to the motivational exercise.
   Elicit: There will be expenses to repair damage to the automobile, the property, and for any bodily injuries.
2. Ask, "Who would be responsible for paying these expenses?"
   Elicit: a) The owner of the car is the responsible party.
   b) Automobile insurance protects the owner against financial losses.

3. Ask, "What types of coverage are offered by automobile insurance companies?"

   Elicit: a) There is bodily injury and property damage coverages to protect us from financial losses when our cars are involved in an accident. Most states require these types of insurance to register an automobile in their state.

   b) Comprehensive insurance protects us from losses due to fire, theft, vandalism, and other forms of damage.

   c) Collision insurance will pay to repair the damage to your automobile if it is involved in an accident.

4. Ask, "How does an insurance company decide what you will pay as an annual premium to insure your car?

   Elicit: The annual premium depends on the base premium and your driver-rating factor.

   a) These factors determine the base premium:
      - i) The amount of coverage you want.
      - ii) The age group of your car.
      - iii) The size and the value of your car. (Insurance Rating Group.)
      - iv) The amount of any deductible clauses.

   b) The driver-rating factor is established by statisticians called actuaries who compare you to past driving records of other drivers in your category.

      Note to teacher (This will be discussed in more detail in the next lesson.)

   c) The insurance companies compute the annual premium by taking the product of the base premium and the highest driver-rating factor of those people who drive the car.

      ANNUAL PREMIUM = BASE PREMIUM x DRIVER-RATING FACTOR

5. Distribute sample tables and question students about the information that it contains.

6. Model with the students the solution of Application #1.

7. Have students solve Applications #2 and #3.

COVERAGE	AGE GROUP	INSURANCE RATING GROUP 1-5	6	7	8	9	10
FULL COMPREHENSIVE	A	$23.20	$ 26.40	$ 30.10	$ 34.30	$ 47.50	$ 61.50
	B	20.00	22.90	26.40	29.70	38.90	50.20
	C	16.90	19.20	23.20	26.40	30.00	44.30
	D	14.10	16.50	19.00	22.80	26.80	38.90
COMPREHENSIVE $100 DEDUCTIBLE	A	$16.90	$ 21.10	$ 25.60	$ 30.10	$ 41.20	$ 54.90
	B	14.20	17.90	21.80	26.40	35.30	43.80
	C	13.10	15.20	18.30	21.90	26.00	38.10
	D	10.30	12.80	14.40	18.20	22.10	31.20
COLLISION $50 DEDUCTIBLE	A	$98.20	$104.60	$120.10	$141.20	$163.40	$181.20
	B	87.40	91.30	98.90	120.00	141.80	163.90
	C	79.60	84.20	89.40	105.30	129.10	145.20
	D	72.80	74.10	81.30	99.10	114.50	128.30
COLLISION $100 DEDUCTIBLE	A	$80.10	$ 90.10	$104.50	$125.10	$149.30	$162.90
	B	76.40	83.20	93.80	114.90	133.80	145.40
	C	68.90	78.10	80.40	95.60	119.60	133.10
	D	60.10	69.90	79.30	87.40	99.85	111.50

PROPERTY DAMAGE LIMITS	BODILY INJURY LIMITS 15/30	25/100	50/100	100/300
$10,000	$94.30	$111.20	$117.80	$135.60
$25,000	$98.50	$116.00	$123.20	$141.50
$50,000	$102.20	$122.40	$130.00	$148.20

APPLICATIONS:

1. Thomas Cruz has his truck insured for $50,000 property damage, 50/100 bodily injury, full comprehensive, and $100-deductible collision coverages. The truck is classified B-9. His driver-rating factor is 1.90. Using the tables determine the annual premium.

2. Laura Marro uses her car primarily to run errands. She has comprehensive with $100-deductible, 100/300 bodily injury, $50,000 property damage and $100-deductible collision coverages. Her driving-rating factor is 3.10 and her car is classified C-7. What is Laura's annual premium?

3. David Lin is a computer consultant and meets with people at their places of business. He has 100/300 bodily injury and $25,000 property damage, full comprehensive, and $50-deductible collision coverages. His driver-rating factor is 2.15 and his car is classified D-6. Rather than pay one large premium, he decides to pay semi-annual premiums. Each semi-annual premium is 50.75% of the annual premium. What are David's semi-annual premiums?

SOLUTIONS TO APPLICATION PROBLEMS:

1. 1. Find the Annual Base Premium.
   Value from the Tables.
   50/100 bodily injury, $50,000 property damage $130.00
   Full comprehensive 38.90
   Collision $100-deductible 133.80
   Annual Base Premium $302.70
   2. Find the Driver-Rating Factor 1.90
   3. Find the Annual Premium.
   Annual Base Premium x Driver-Rating Factor
   $302.70 x 1.90 = ... $575.13

2. 1. Find the Annual Base Premium.
   Value from the Tables.
   100/300 bodily injury $148.20
   Comprehensive $100-deductible 18.30
   Collision $100-deductible 80.40
   Annual Base Premium $246.90
   2. Find the Driver-Rating Factor 3.10
   3. Find the Annual Premium.
   Annual Base Premium x Driver-Rating Factor
   $246.90 x 3.10 = ... $765.39

3. 1. Find the Annual Base Premium.
   Value from the Tables.
   100/300 bodily injury $25,000 property damage $141.50
   Full Comprehensive 16.50
   Collision $50-deductible 74.10
   Annual Base Premium $232.10
   2. Find the Driver-Rating Factor 2.15
   3. Find the Annual Premium.
   Annual Base Premium x Driver-Rating Factor
   $238.80 x 2.15 = ... $499.02
   4. Find the Semiannual Premium.
   Annual Premium x 50.75%
   $499.02 x .5075 = ... $253.25

SUMMARY:

1. What types of coverage should you have to protect you against financial losses while driving your car?
2. How does the insurance company determine your annual premium?
3. How can you save money on your annual premiums?

CONSUMER MATHEMATICS

LEISURE

LESSON: 4

AIM: How does the Driver-Rating Factor determine insurance premiums?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Determine the driver-rating factor from a table.
2. List the factors that determine the rating.

MOTIVATION:

Charles White and Peggy Gasper are good friends and neighbors. One day while discussing their cars, Peggy mentions that her annual premium is $630. This comes to Charles as a surprise because while he is insured with the same company and has the same car and coverage limits, he pays an annual premium of $1040.

What could account for the difference in their annual premiums?

DEVELOPMENT:

1. Ask the students for their responses to the motivational exercise. Elicit:
    1) The base premium is the same because the cars are identical, they live in the same area, and have the same limits on their coverages.
    2) The annual premium is the product of the base premium and the driver-rating factor. The driver-rating factors must be different since the base premiums are the same.
2. Ask, "What does the driver-rating factor depend on?"
   Elicit: 1) The driver-rating factor depends on:
    - a) Your age.
    - b) Marital status.
    - c) Whether you are male or female.
    - d) The purpose for which you drive.

3. Ask, "How do insurance companies use these characteristics to determine the driver-rating factor? Elicit: 1) Rating factors were developed by insurance companies after long experience with automobile accidents.

4. Explain: "For example, actuaries have found that for every 100 accidents by adults who drive for mainly pleasure, there were 430 accidents involving males under 21 who drive mainly for pleasure. The adult is given a rating factor of 1.00.

5. Ask, "What rating factor should be assigned to a driver who is male, under 21, and drives mainly for pleasure?" Why? Elicit: The ratio of the number of accidents of the adult to the male, under 21, who drives mainly for pleasure is 430:100 or 4.30:1.00. The rating factor would be 4.30.

6. Distribute the Driver-Rating Factor tables and examine them with the students.

7. Have the students do Applications #1-#3.

8. Ask, "If there is more than one driver who uses the car, what would be the rating factor used for insurance premium?"
   Inform the students: The highest factor of the drivers is the one used for insurance purposes.

9. Have students do Application #4.

10. Have students do Application #5.

DRIVER RATING FACTORS FOR AUTOMOBILE INSURANCE

DRIVER CLASSIFICATION	MULTIPLE OF BASE PREMIUM	
ADULT AND SENIOR OPERATORS	ADULT	SENIOR-OVER AGE 65
Pleasure	1.00	0.95
Average weekly mileage to and from work:		
Over 30, Not Over 100	1.06	1.00
Over 100	1.17	1.12
Business use (Salesperson, etc.)	1.40	1.35
Farm automobile	0.85	0.75

	UNDER 21 YEARS		21-24 YEARS		25-29 YEARS
Unmarried youthful operators	Occasional Operator	Principal Operator	Occasional Operator	Principal Operator	Principal Operator
Females					
Pleasure	1.75	2.00	1.50	1.70	CLASSIFY AS ADULT
To and from work or business use	1.90	2.20	1.70	2.05	
Farm Automobile	1.45	1.60	1.25	1.40	
Males					
Pleasure	2.65	4.30	2.10	3.40	1.90
To and from work or business use	3.00	5.10	2.40	3.00	2.30
Farm Automobile	2.15	3.40	1.65	2.50	1.60

Married youthful operators			
Males	Under 21 years	21 or 22 years	23 or 24 years
Pleasure	2.35	1.85	1.65
To and from work	2.70	2.10	2.00
Farm Automobile	1.95	1.45	1.20

*MARRIED YOUTHS FEMALE OPERATORS ARE CLASSIFIED AS ADULTS

APPLICATIONS:

1. From the tables find the driver-rating factor of Sally Kim who is 20 years old, unmarried, drives to school, and is the occasional driver of the car.

2. From the tables find the driver-rating factor of Carlos Hernandez who is 21, married, and drives to and from work.

3. From the tables find the driver-rating factor of Sally Riley who is 23, married, and uses her car to deliver office supplies.

4. Robert Hayes is 37, drives his car to and from work, 13 miles each way, five days a week. His daughter, Cassie, age 17, is unmarried and occasionally drives the car for pleasure. Which driver-rating factor will be used to determine the annual insurance premium?

5. You are 17 years old, unmarried, and you are the principal operator of your car which you use for pleasure. Your car is classified B-9 and you have $25,000 property damage, 50/100 bodily injury limits, $100-deductible comprehensive, and $100-deductible collision coverages. What is your annual premium?

SOLUTIONS TO APPLICATION PROBLEMS:

1. From the table: Unmarried youthful operator, female, under 21, occasional operation, to and from work (1.90).
2. From the table: Married youthful operator, male, 21 or 22 years, to and from work (2.10).
3. From the table: Married, female, 23 years considered an adult, uses the car for business (1.40).
4. From the table:
   Robert Hayes, adult, drives 13x2x5 = 130 miles per week, over 100 miles, rating = 1.17.
   Cassie, female, unmarried, occasional driver, under 21, pleasure rating = 1.75.
   The highest rating is the one use for insurance = 1.75.
5. This problem will have two solutions depending on whether it is solved for a male or a female.

1. 1. Find the base premium.

50/100 bodily injury, $25,000 property	$123.20
$100-deductible comprehensive	35.30
$100-deductible collision	133.80
	$292.30

2. Find the Driver-Rating Factor

Male	4.30
Female	2.00

3. Find the annual premium.

	Base Premium	x	Driver-Rating Factor		
Male:	$292.30	x	4.30	=	$1256.89
Female:	$292.30	x	2.00	=	$ 584.60

SUMMARY:

1. What characteristics are used to determine the driver-rating factor?
2. Which drivers have the highest and lowest rating factors? Why?

CONSUMER MATHEMATICS

LEISURE

LESSON: 5

AIM: What are the expenses of operating and maintaining an automobile?

PERFORMANCE OBJECTIVES: The student will be able to...

1. List variable costs (gasoline, tires, etc).
2. List fixed costs (automobile insurance, registration fees, depreciation, etc).
3. Compute the total cost per mile of operating and maintaining an automobile.

VOCABULARY: fixed costs, variable costs, depreciation

MOTIVATION:

John Shumate saved for two years in order to buy a Bronco-ZX. He soon finds that he is using public transportation more than he is using his Bronco.

Why do you think this might have happened?

DEVELOPMENT:

1. Ask the students for their responses to the motivational exercise.

   Elicit: 1) It might have been faster to take public transportation.

   2) While the Bronco was more convenient it was too costly to run.

2. Ask, "What are the costs of operating and maintaining an automobile?"

   Elicit: There are many costs in operating and maintaining an automobile? Among these are:

   a) Gasoline and tires.

   b) Maintenance i.e. oil changes, tune-ups, wheel alignments.

   c) Registration and inspection fees.
   d) Automobile insurance.
   e) Financing.
   f) Depreciation.

3. Ask, "What is depreciation?"
   Elicit: Depreciation is a decrease in the value of your car because of its age and condition.

4. Ask, "Which of the costs that we have discussed can vary during the year?"
   Elicit: 1) Gasoline, tires, and maintenance will increase as the number of miles you drive increases.

5. Inform the students: Expenses that stay about the same regardless of the number of miles driven are called fixed costs while those that increase with increased mileage are called variable costs.

6. Ask, "How would we compute the cost per mile of maintaining and operating an automobile?"
   Elicit: (1)

$$\text{Cost per Mile} = \left(\text{Annual Variable Cost} + \text{Annual Fixed Cost}\right) \div \text{Number of Miles Driven}$$

7. Model Application #1 with students.

8. Have the students do Application #2.

9. Have students do Application #3.

APPLICATIONS:

1. Barbara Mannix, sales representative, drove 12,500 miles last year. Fixed costs totaled $1,425. Variable costs totaled $927. What was the cost per mile?

2. Margarita and Oscar Moreno each own a car of the same model. Oscar drove 25,230 miles, while Margarita drove 9,725 miles. Each had fixed costs totaling $2,132.25. Oscar's variable cost was $4,278.50, and Margarita's totaled $855.15.
   a) How much money did Oscar spend to operate and maintain his car on a cost-per-mile basis?
   b) How much did Margarita spend per mile?

3. Benjamin Williams purchased an automobile for $2,000 one year ago. He drove about 9,000 miles during the year. He estimates the car's present value at about $1,400. Using his records compute the cost per mile for Benjamin to operate his car last year.

Variable Costs		Fixed Costs	
Gasoline	$750.00	Insurance	$765.40
Oil	60.00	Registration	47.15
Maintenance	210.90	Depreciation	?
New time	62.88		

SOLUTIONS TO APPLICATION PROBLEMS:

1. Find the Cost Per Mile.

(Annual Variable Cost + Annual Fixed Cost) ÷ Number of Miles Driven

($927 + $1,425) ÷ 12,500

$2,352 ÷ 12,500

$.18816....$.19

2.(a)

Cost per Mile = (Annual Variable Cost + Annual Fixed Cost) ÷ Number of Miles Driven

= ($4278.50 + $2132.25) ÷ 25,230

= $6410.75 ÷ 25,230

= $.25404....$.25

(b)

($855.15 + $2132.25) ÷ 9725

= $2987.40 ÷ 9725

= $.30718....$.31

Oscar paid $.25 per mile. Margarita paid $.31 per mile.

3. Variable Costs = $750 + $60 + $210.90 + $62.88
= $1083.78
Depreciation = $2000 - $1400 = $600
Fixed Costs = $765.40 + $47.15 + $600
= $1412.55

$$
\begin{aligned}
\text{Cost per Mile} &= \left(\text{Annual Variable Cost} + \text{Annual Fixed Cost}\right) \div \text{Number of Miles Driven} \\
&= (\$1083.78 + \$1412.55) \div 9000 \\
&= \$2496.33 \div 9{,}000 \\
&= \$.27737\ldots.\$.28
\end{aligned}
$$

SUMMARY:

1. Before buying a car what costs should first be considered?
2. How would you determine if it were more expensive to take public transportation to work or to drive your car?

LESSON: 6

AIM: What are the expenses associated with automobile leasing?

PERFORMANCE OBJECTIVES: The student will be able to...

1. List charges for leasing an automobile:
   - a) Daily rate vs. weekly rate.
   - b) Rate per mile.
   - c) Insurance.
   - d) Collision waivers.
2. Compute the cost per mile for leasing an automobile.

VOCABULARY: collision waiver

MOTIVATION:

Sally Pringle and Tom Burns are going to lease a luxury sedan for the senior prom. They plan to rent the car for a day. What will their total cost for leasing the car depend on?

DEVELOPMENT:

1. Ask the students for their responses to the motivational exercise.
   Elicit: 1) The total cost will depend on:
   - a) The daily rate.
   - b) Rate per mile driven.
   - c) Gasoline used.
   - d) Insurance.
2. Ask, "Who will be responsible financially if while the car is parked the driver's door is hit and damaged?
   Elicit: The insurance generally has a collision deductible which makes the renter liable for a portion of any damage to the car.

   Inform the students: They can have complete coverage called a collision waiver by paying an additional charge per day.

3. Ask, "How will we compute the cost per mile for leasing an automobile?" Elicit:
   Cost Per Mile = Total Cost ÷ Number of Miles Driven

4. Model with the students the solution to Application #1.

5. Ask, "Are there any ways you can save money when leasing a car?"
   Elicit: 1) Look for sales promotions offered by airlines and vacation packages which offer discounts on rates.
   2) The rental rate will increase as the size and options on the automobile increase.
   3) Compare weekly versus daily rates for savings.

6. Have the students do Application #2.

7. Have the students do Application #3.

APPLICATIONS:

1. Pamela Grant decides to lease a mini-van for her vacation. The mini-van leases for $24.75 a day plus 23¢ a mile. She plans to use the car for 6 days and drive it about 2500 miles. Whe estimates the gas will cost her about $145. A collision waiver is $3.50 a day. What will be her total cost to lease the mini-van? How much would it cost per mile?

2. Peter Costas is offered two different deals on leasing the same mid-size car. The car leases for $22.50 a day plus 24¢ a mile. He plans to use the car for 6 days and drive about 500 miles. He estimates that gasoline will cost about $40. The leasing company is also offering this car for a one week rental with no mileage charge for $210. Which of the agreements should he make? Why?

3. Rosa Ortiz is moving to a new apartment. She can rent a 12-foot truck for $27 a day plus 17¢ a mile or a 16-foot truck for $34 a day plus 20¢ a mile. It would take 4 trips in the 12-foot truck but only 3 trips to make the move in the larger truck. She estimates that gasoline will cost $20 for either truck which she will keep just for the day. A round trip to her new apartment is 66 miles. What size truck should she rent to save expenses? How much would it cost per mile to lease the truck?

SOLUTIONS TO APPLICATION PROBLEMS:

1. 1. Find the total cost.

a) Daily cost: 24.75 x 6................ $148.50

b) Mileage cost: 23¢ x 2500.............. 575.00

c) Gasoline cost......................... 145.00

d) Collision waiver: $3.50 x 6........... 21.00

Total cost = $889.50

2. Find the number of miles driven: 2500

3. Find the cost per mile:

Total Cost ÷ Number of Miles Driven

$889.50 ÷ 2500

$.3558...................... $.36

Total cost $889.50. Cost per mile $.36

2. 1. Find the total cost at the daily rate.

a) Daily cost: $22.50 x 6............... $135.00

b) Mileage cost: 24¢ x 500.............. 120.00

c) Gasoline cost........................ 40.00

Total cost = $295.00

2. Find the total cost at the weekly rate.

a) Weekly rate.......................... $210.00

b) Mileage cost......................... 0.00

c) Gasoline cost........................ 40.00

Total cost = $250.00

Peter should choose the weekly rental because he will save $45 ($295 - $250).

3. 1. Find the total cost of 12-foot truck.

a) Daily cost: $27.00 x 1............... $27.00

b) Mileage cost: 17¢ x 264.............. 44.88

c) Gasoline cost........................ 20.00

Total cost = $91.88

2. Find the total mileage of 12-foot truck

66 x 4.................... 264

3. Find the total cost of the 16-foot truck.

   a) Daily cost: $34.00 x 1............... $34.00

   b) Mileage cost: 20¢ x 198.............. 39.60

   c) Gasoline cost......................... 20.00

   Total cost $93.60

4. Find the total mileage of the 16-foot truck.

   66 x 3..................... 198

5. Cost per mile of the 12-foot truck.

   Total Cost ÷ Number of Miles Driven

   $91.88 ÷ 264

   .3480...................... $.35

   Rosa should choose the 12-foot truck.

   Her cost per mile will be $.35.

SUMMARY:

1. What charges will there be when we lease a car or truck?
2. How do we compute the cost per mile for leasing an automobile?

CONSUMER MATHEMATICS

LEISURE

LESSON: 7

AIM: What are the costs of using the rapid transit system?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Compute the monthly cost of single fares.
2. Find the cost of a monthly pass.
3. Compute the monthly cost of driving.
4. Determine whether public or private transportation is more economical.

VOCABULARY: break-even point

MOTIVATION:

You have accepted a position with a law firm in the city. You live in the suburbs. You can get to work via public transportation or you can drive your car to and from work.

What factors would you consider when deciding which way to get to work?

DEVELOPMENT:

1. Ask the student for their responses to the motivational exercise.
   Elicit: 1) There are two major areas to be considered.
   a) Convenience b) Economy

   2) Questions to be considered for convenience:
      a) Is there easy access to public transportation at work and at home?
      b) How long will the trip take via public transportation and driving during rush hours?
      c) Is the rapid transit system time schedule appropriate for you needs?
      d) Is parking available at work?

3) Questions to be considered for economy?

   Driving

   i) What is the cost of gasoline and maintenance?

   ii) Are there any tolls to be payed?

   iii) What is the cost for parking?

   Rapid Transit

   i) What is the cost of a one-way fare?

   ii) Is there a monthly pass available?

2. Pose: "Suppose there is a monthly pass available. How could we determine if a monthly pass was more economical than single fares?"
   Elicit: 1) We could compare the cost of a monthly ticket to the total cost of the daily fares for the month.

3. Ask, "How would we compute the monthly cost of the daily fares?" Elicit:
   1) Monthly Cost = Single Fare x Days Per Month x Trips Per Day

4. Have the students do Application #1.

5. Define: The break-even point.

6. Have the students do Application #2.

7. Have the students do Application #3 and model the solution.

8. Have the students do Application #4.

APPLICATIONS:

1. Hazel can ride a mini-coach to work for a single fare of $1.75 or buy a monthly pass for $80. She makes 25 round trips monthly. Which is more economical?

2. Kin Cheung has the choice of single fares of $1.40 or a monthly pass of $60. In addition he has been invited to join in a car pool and share in monthly expenses of $188 with two other people. If he makes 21 round trips a month which is the most economical way to get to work?

3. Jason Reid drives 18 miles to work from his home. He makes 5 round trips each week. A weekly bus pass costs

$25. A one-way fare is $2.75 if Jason drives his own car, it costs 19¢ a mile and $1 a day for parking. Find Jason's weekly cost of getting to work by each method. Which is the most economical?

4. Laura, May, and Cal have been car pooling the 25 mile one-way trip to and from work. They share the weekly cost of $44 for gas and parking. A new bus service is available for $1.50 for a one-way trip. Monthly passes are available at $60 each. Assuming that they make 23 round trips per month and a month is $4\frac{3}{5}$ weeks, which method of transportation is most economical? If another person joins the car-pool, which method of transporation will be the most economical?

SOLUTIONS TO APPLICATION PROBLEMS:

1. Monthly Cost = Single Fare x Days Per Month x Trips Per Day
   = $1.75 x 25 x 2
   = $87.50

   The monthly pass for $80 is more economical.

2. 1. Find the monthly cost of single fares.
   Monthly Cost = Single Fare x Days Per Month x Trips Per Day
   = $1.40 x 21 x 2
   = $58.80 .... $58.80
   2. Find the cost of a monthly pass............. $60.00
   3. Find the monthly cost of driving
   188 ÷ 3........................... $62.67
   4. The most economical way is Single Fares ($58.80)

3. 1. Find the weekly cost of single fares.
   Single Fare x Days Per Week x Trips Per Day
   $2.75 x 5 x 2........ $27.50
   2. Find the cost of a weekly pass.............. $25.00
   3. Find the weekly cost of driving
   a) Mileage x Cost per mile
   5 x 36 x $.19........................... $34.20
   b) Parking fees
   5 x $1................................. 5.00
   $39.20
   4. The most economical method is a weekly pass.

4. 1. Find the monthly cost of single fares.

Single Fare x Number of Days x Number of Trips

$1.50 x 23 x 2....... $69.00

2. Find the cost of a monthly ticket............ $60.00

3. Find the monthly cost of driving (3 drivers).

a) # of weeks in the month x weekly expenses.

$4\frac{3}{5}$ x $44.......... $202.40

b) Each member expenses.

$202.40 ÷ 3.......................... $67.47

4. The most economical is a monthly ticket ($60.00).

5. Find the monthly cost of driving (4 drivers).

$202.40 ÷ 4.......................... $50.60

6. The most economical method would now be a car-pool ($50.60).

SUMMARY:

1. How will you decide what is the best way to get to work?
2. How can you determine the break-even point on a monthly rapid transit pass?

CONSUMER MATHEMATICS

LEISURE

LESSON: 8

AIM: What are the costs of taking a taxicab?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Find the cost of the first mile or less.
2. Find the cost of additional miles or fractions of a mile.
3. Compute the total cost of taking a taxicab.

VOCABULARY: fares, flat rate, base price, odometer

MOTIVATION:

Raphael, who speaks very little English, hires a taxicab to take him to his hotel which is 10.2 miles from the airport. The driver tells him he will charge him a flat rate of $15 or he can leave the meter running. Raphael understands very little of this conversation and turns to you for help. What advice will you give Raphael?

DEVELOPMENT:

1. Ask the students for the advice they would give to Raphael.
2. Ask, "What is a flat rate?"
   Inform the students that a flat rate is a preset price to be driven to a destination.
3. Ask, "What are metered rates?"
   Elicit: Most taxicabs charge by the distance traveled.
4. Inform the students: Licensed taxicabs in New York City are required to charge the same fares throughout the city. Meters in the taxi's monitor the distance traveled and record the charges.
5. Pose: Application #1 for the students to solve and discuss.

6. Have the students do Application #2.

7. Ask, "What happens to the costs of riding a taxicab when you get caught in a traffic-jam.
Elicit: Most city companies charge for the time required for the trip as well as the distance traveled.

8. Ask, "Are there any other charges associated with using a taxicab?"
Elicit: It is usually customary to tip the driver of the taxi.

9. Have the students do Application #3 to illustrate the charge for the time required for the trip.

10. Have the students do Application #4.

APPLICATIONS:

1. Raphael's friend points to the cab rates on the door of the taxi:

GRAB - A - CAB Rates	
First Mile Or Less	$1.90
Second Mile Or Less	$1.30
Third Mile Or Less	$ .95
Each Additional Mile Or Fraction of a Mile	$ .85

The driver offered him a flat rate of $15 or the metered rate. Which method is more economical?

2. Lorenzo Colasante takes a Yellow Cab to a baseball game. The distance traveled is 4.6 miles. The cab's fares are $1.50 for the first mile or less, $1.10 for the second mile, and 45¢ for each additional half mile or fraction of a half mile. If he tips 15% of the fare, what is the total cost of taking the taxi?

3. Frank Santana takes the Green Cab to go to a concert. The Green Cab rates are $1.15 base plus 15¢ for every 1/6 mile plus 15¢ for every two minutes. There was a traffic jam and the 3-mile trip took 42 minutes. Frank tipped the driver 15% of the fare. What was his change from a ten dollar bill?

4. Chris Boyer took a Green Cab to her friends house. The odometer read 107457.4 at 8:17 P.M. when she entered the cab. She arrived at 8:45 P.M. with the odometer on 107460.9. If she gave the cab driver $8.00, what percent of the fare was her tip?

SOLUTIONS TO APPLICATION PROBLEMS:

1. 1. Find the miles traveled.................. 10.2 miles
   2. Find the cost of the First mile.......... $ 1.90
   3. Find the cost of the Second mile......... $ 1.30
   4. Find the cost of the Third mile.......... $ .95
   5. Find the # of additional mile
      (10.2 - 3) ÷ 1 = 7.2 rounded up to 8
      8 x $.85.................................. $ 6.80
   6. Find the Total Cost...................... $10.95

   Raphael should tell the driver to leave the meter running.

2. 1. Find the miles traveled.................. 4.6 miles
   2. Find the cost of the First mile.......... $1.50
   3. Find the cost of the Second mile......... $1.10
   4. Find the # of additional 1/2 mile units
      (4.6 - 2) ÷ 1/2 = 5.2 ≈ 6
      6 x .45................................... $2.70
   5. Find the Total Fare...................... $5.30
   6. Find the Tip
      .15 x $5.30 = .795 ≈ .80
   7. The Total Cost........................... $6.10

3. 1. Find the number of miles traveled....... 3 miles
   2. Find the Base price...................... $1.15
   3. Find the number of 1/6 mile units
      3 ÷ 1/6 = 18
      18 x .15.................................. $2.70
   4. Find the cost of the time traveled.
      (42 ÷ 2) x .15............................ $3.15
   5. Find the Fare............................ $7.00
   6. Find the Tip
      .15 x 7.00................................ $1.05
   7. Find the Total Cost...................... $8.05
   8. Find the change $10.00 - 8.05 = $1.95

4. 1. Find the number of miles traveled.
107460.9 - 107457.4 = ... 3.5 miles
2. Find the Base price..................... $1.15
3. Find the number of 1/6 mile units
$3.5 \div 1/6 = 21$
21 x .15............................. $3.15
4. Find the cost of the time traveled.
(28 ÷ 2) x .15....................... $2.10
5. Find the Fare......................... $6.40
6. Find the amount tipped.
$8.00 - $6.40........................ $1.60
7. Find the percent tipped.
$\frac{1.60}{6.40} = \frac{x}{100}$........................... .25
25%

SUMMARY:

1. What are the advantages and disadvantages of taking a taxicab?
2. What are the methods of paying the fare for a taxicab?

LESSON: 9

AIM: What are the costs of air travel?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Determine from published flight schedules:
   a) Arrival and departure times.
   b) Fares for different classes of travel.
2. Compute the cost per mile of air travel.

VOCABULARY: departure, first class, coach, F, Y, FN, YN

MOTIVATION:

You are planning a trip to Toronto. You can fly, drive, or take a train.

Pick a method of travel and convince your friend that this method is the best alternative.

DEVELOPMENT:

1. Ask the students to make their arguments for their choices.
2. Ask, "What are the advantages of flying?"
   Elicit: 1) The major advantage of flying is that it is usually the fastest means of transportation.
3. Ask, "Are there any disadvantages to flying?"
   Elicit: 1) You cannot stop the airplane and get out.
   2) Delays in airlines schedules because of weather and mechanical difficulties.
   3) Waiting for or losing your luggage.
   4) The scenery can be very boring.
   5) Non-direct flights with stop overs.
4. Ask, "Which means of transportation is the most expensive?"
   Elicit: You would expect air travel would be the most expensive. Airlines offer a variety of different fares.

5. Ask, "What type of fares are available?"
   Inform the students: There are coach, first class, super savers, and various discount fares. In addition, travel at off-peak hours and night travel will usually be less expensive than traveling during peak and day travel.
   * Note * Many fares are subject to restriction on travel.

6. Ask, "How can you obtain information on fares and schedules?"
   Elicit: You can call a travel agent or read a published flight schedule that give one-way trip fares, departure and arrival times and flight numbers.

7. Distribute sample flight schedules and discuss the information that is available on it.
   Note: Airline schedules can be obtained from the major airlines.

8. Have the students do Application #1.

9. Have the students do Application #2.

10. Have the students do Application #3.

11. Have the students do Application #4.

LEAVE	ARRIVE	FLIGHT #	STOPS OR VIA	FREQ
FROM: NEW YORK (EST)				
TO:				
FT. LAUDERDALE (EST)			1065 mi.	F 365.00 Y 225.00 FN 222.00 YN 179.00
9:00 a	11:30 a	740	Nonstop	Daily
4:55 a	11:30 p	172/481	Atlanta	Daily
CHICAGO (EST)			1910 mi.	F 258.00 Y 161.00 FN 161.00 YN 129.00
11:00 a	6:05 p	166/382	Atlanta	Daily
5:05 p	1:57 a	22/222	Atlanta	Daily
12:45 a	8:09 a	152/600	Atlanta	EX SP
LAS VEGAS (EST)			2450 mi	F 412.00 Y 310.00 FN 320.00 YN 220.00
7:00 a	10:34 a	711	One-stop	Daily
2:50 p	7:59 p	918/791	Atlanta	Daily
11:15 p	9:10 a	704/539	Chicago	EX SP

APPLICATIONS:

1. Bob Burns flew from New York to Chicago. He traveled first class night. What was his air fare? What was his cost per mile?

2. Fran and Alice want to fly to Ft. Lauderdale to get a tan. They travel first class day. What is the one-way fare of each? How much could they save by flying coach class night? What is the cost per mile flying first class day?

3. Talfus Muhammed is going to a convention in Las Vegas. If he flies first class night, what is his cost per mile?

4. Carol Butera wants to go from New York to Montreal, a 690 mile round trip. She could fly from $95 round trip or drive her car $.20 a mile. Which is less expensive per mile, flying or driving? If she goes with a friend which way of traveling is less expensive?

SOLUTIONS TO APPLICATION PROBLEMS:

1. 1. Find the First Class Night Air Fare......... $161
   2. Find the mileage traveled.................. 1910 mi
   3. Find the cost per mile.
      $161 ÷ 1910 = $.0842..................... $.08

2. 1. Find the First Class Day Fare............... $365
   2. Find the Coach Night Fare.................. $179
   3. Find the Difference.
      $365 - $179............................. $186
   4. Find the cost per mile traveling First Class Day.
      $365 ÷ 1065 = .3427...................... $.34

3. 1. Find the First Class Night Fare............. $320
   2. Find the mileage traveled.................. 2450 mi
   3. Find the cost per mile.
      $320 ÷ 2450 = .1306...................... $.13

4. 1. Find the cost of the Air Fare............... $95
   2. Find the mileage traveled.................. 690 mi
   3. Find the cost per mile flying.
      $95 ÷ 690 = .1376........................ $.14

Flying is less expensive than driving ($.14 vs $.20). If she goes with a friend it would be less expensive to drive than to fly (.10 per mile = $69 round trip).

SUMMARY:

1. Why would a business man be more likely to fly than to drive from New York to Washington D.C.?
2. If you were taking your family on vacation to Canada, what factors would you consider before flying or driving?

CONSUMER MATHEMATICS

LEISURE

LESSON: 10

AIM: How do we plan a budget for vacation costs?

PERFORMANCE OBJECTIVES: The student will be able to...

1. List the factors determining the cost of a vacation:
   a) Basic charge for length of time.
   b) Mode of transportation.
   c) Food and other expenses.
2. Compute the total vacation cost.

VOCABULARY: miscellaneous expenses, lodging, land/air package

MOTIVATION:

Bob and Peggy are planning a ski trip during their winter vacation. What expenses should they consider in planning their vacation?

DEVELOPMENT:

1. Ask, "What are the major considerations when planning a vacation?"
   Elicit: The two major factors to consider are (a) cost and (b) length of vacation time.
2. Ask the students for the expenses they considered in the motivational exercise.
   Elicit: The major costs are for:
) Basic charges for lodging.
   b) Transportation.
   c) Food.
   d) Other Expenses (i.e. entertainment etc).
3. Have the students plan a five day vacation. Have them generate a list of expenses that they might expect. If brochures are available from a local travel agent they can use them to approximate their expenses for the five days. For example if they decide to go skiing they should

anticipate a basic charge for lodging, transportation costs, food costs and miscellaneous expenses.

4. Ask, "What other expenses or miscellaneous expenses would they anticipate on a ski trip?"
   Elicit: On a ski trip you should expect to pay a fee for the rental of skis and lift tickets. (You might also want to anticipate a fee for medical insurance.)
5. Have the students find the solution to Application #1.
6. Have the students do Application #2.
7. Ask, "Are there any ways to save expenses when you plan a vacation?"
   Elicit: 1) Look for discounted air/land packages which offer discounts on transportation and lodging.
   2) Many resorts offer discounts for lodging during off season periods to stimulate business.
   3) Look for vacation packages that include food and entertainment as well as lodging for an all inclusive price. i.e. (cruise lines).
8. Have the students do Application #3.
9. Have the students do Application #4.

APPLICATIONS:

1. Bob and Peggy have saved $1000 for their vacation. They have decided on going to a ski lodge that charges $65/day. They estimate that driving Bob's car will cost $.18 a mile for the 560 mile round trip. If they stay for five days they figure their meals will cost them about $200. Lift tickets and ski rentals will cost them about $180. Miscellaneous expenses will be about $150. What will be the total cost of the vacation? Will they stay within their budget?
2. The Keyes family rented a motor home for the three-week cross country trip. The rental cost them $450 a week, plus 13¢ a mile. They traveled 3150 miles. The cost of gasoline and oil was $480. Food cost an average of $55 per day for the family. Other expenses came to $430. Find the total cost of the vacation.

3. Samson and Delilah are considering a 7-day Caribbean cruise. Round trip flight to the port is $260 each. The cruise charge is $845 each. Miscellaneous expenses are about $125. Find the total cost of the vacation.

4. Barbara Beauty plans to spend three weeks at a seaside resort whose seasonal rates are $290/week. After Labor Day there is a 40% reduction in the rate. She plans her vacation to extend from 2 weeks before Labor day until 1 week after Labor day. Her transportation is $75 and her other costs including food will cost about $420. What is the total cost of her vacation?

SOLUTIONS TO APPLICATION PROBLEMS:

1. 1. Find the basic charge.
Number of days x Cost per day
5 x $65.................. $325.00
2. Find the cost of transportation.
Number of miles x Cost per mile
560 x $.18................. $100.80
3. Find the other costs.
Food + Tickets + Miscellaneous
$200 + $180 + $150................. $530.00
4. Find the total vacation cost. $955.80

The total vacation cost was $955.80 and is within their budget.

2. 1. Find the basic charge.
Number of days x Cost per day
3 x $450.................. $1350.00
2. Find the cost of transportation.
Mileage charge + Fuel
($.13 x 3150) + $480
$409.50 + $480...................... $ 889.50
3. Find the other costs.
Food + Other expenses
($55 x 21) + $430
$1155 + $430......................... $1585.00
4. Find the total vacation cost. $3824.50

3. 1. Find the basic charge.

$845 x 2.................................. $1690.00

2. Find the cost of transportation.

$260 x 2.................................. $ 520.00

3. Find the other costs...................... $ 125.00

4. Find the total vacation cost. $2335.00

4. 1. Find the basic charge.

	Number of days	x	Cost per week	
Seasonal	2	x	$290.......	$ 580.00
Non-Seasonal	1	x	$174 (40% Disc).	$ 174.00

2. Find the cost of transportation............ $ 75.00

3. Find the other costs...................... $ 420.00

4. Find the total vacation cost. $1249.00

SUMMARY:

1. What are the major costs of a vacation?

2. a) What information will you need to plan a vacation?
   b) Where can you get this information?

CONSUMER MATHEMATICS
LEISURE
LESSON: 11

AIM: What are the fees involved in belonging to a health club?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Compute the cost per visit.
2. Calculate savings from discounted membership fees.

VOCABULARY: health club, membership fee, renewal

MOTIVATION:

You visit a fitness center with a friend who is a member. You are given a guest pass. A very persuasive salesperson speaks with you about becoming a member.

What question would you ask before joining the health club?

DEVELOPMENT:

1. Ask, "Why would one want to join a health club?"
   Elicit: In recent years there has been an increased emphasis on physical fitness by both the medical and business communities. One joins a health club:
   1) To exercise.
   2) To lose weight.
   3) To aid physical development.
   4) To maintain good physical condition.
   5) To socialize.
2. Ask, "What types of health clubs are there?
   Elicit: There are health clubs that cater to particular specialities. i.e. weight training, figure salons, spas, tennis and racquetball. Others offer a broad selection of activities. i.e. swimming pools, saunas, exercise apparatus, etc.
3. Ask, "What are the costs of membership?"
   Elicit: There usually is an annual membership fee which entitles you to unlimited use of the facilities.

4. Ask, "How can you save money on membership fees?" Inform the students: Health clubs usually have annual drives for membership at discount prices.

5. Ask, "Is an annual membership worth the price?"
   Elicit: 1) In part it will depend on how much use you make of the facilities?
   2) Cost Per Visit = Membership Fee ÷ Number Of Visits

6. Have the students solve Application #1 and model the solution.

7. Have the students solve Application #2.

8. Inform the students: Salespeople will make it very difficult for you to say no to their offer. They will offer incentives that include tremendous savings on memberships (usually at the first visit only).

9. Distribute a sample of a typical membership fee schedule for discussion.

FIT - AS - A - FIDDLE HEALTH EMPORIUM

Select the plan to suit your needs

#1	Non renewable one-year membership	$380
#2	Renewable two-year membership	$563
#3	* Non renewable one-year membership	$292
#4	* Renewable two-year membership	$414
	ANNUAL MAINTENANCE	$ 70

* Plans #3 and #4 are available on first visit only...NO EXCEPTIONS!

10. Ask, What is the difference between renewable and a non renewable membership?
    Elicit: A renewable contract will be offered at the same price when the contract terminates. A non renewable contract is subject to an increase in fees.

11. Have the students solve Applications #3 and #4 using the fee schedule.

APPLICATIONS:

1. Lucretia Worthington is considering membership in the Venus Body Building Center. The reduced price for new

members is $309 for a year. She plans to use the facility 3 times a week for 35 weeks out of the year. What is her cost per visit?

2. Ara Dubois has just purchased a two-year membership in the Hercules Health Hall. The two-year membership is $549. Ara intends to workout at the club 2 times a week for 44 weeks out of the year. What is his cost per month?

3. On her second visit to the Fit-As-A-Fiddle Health Emporium, Eloise Eaton purchases plan #2.
   a) If she plans to visit the club 2 times a week for 40 weeks for two years, what is her cost per visit?
   b) Had she chosen plan #4 at her first visit, how much might she have saved per visit?

4. Ying Chung has decided to join the Fit-As-A-Fiddle Health Emporium on his first visit. Ying hopes to get to the club 60 times a year.
   a) What will the cost per visit be if he chooses plan #3?
   b) What will the cost per visit be if he chooses plan #4?

SOLUTIONS TO APPLICATION PROBLEMS:

1. 1. Find the membership fees...................... $309
    2. Find the number of visits.
        3 x 35.............................. 105
    3. Find the cost per visit.
        Membership Fee ÷ Number of Visits
        $309 ÷ 105.................... $2.94
        $2.9428

2. 1. Find the membership fees...................... $549
    2. Find the number of visits in 2 years.
        44 x 2 x 2.......................... 176
    3. Find the cost per visit.
        Membership fees ÷ Number of Visits
        $549 ÷ 176
        $3.1193...................... $3.12

3. 1. Find the membership fees Plan #2.

Fees + Maintenance

$563 + (2 x $70)............................ $703

2. Find the number of visits in 2 years.

40 x 2 x 2............................ 160

3. Find the cost per visit Plan #2.

Membership fees ÷ Number of Visits

$703 ÷ 160

$4.393......................... $4.39

4. Find the membership fees Plan #4.

Membership fees + Maintenance

$414 + (2 x $70)................... $554

5. Find the cost per visit Plan #4.

Fees ÷ Number of Visits

$554 ÷ 160

$3.4625.............................. $3.46

(a) Ans: $4.39

(b) The savings would be $.93 per visit ($4.39 - $3.46).

4. 1. Find the membership fees Plan #3.

Fees + Maintenance

$292 + $70 .... $362

2. Find the number of visits - Plan #3...... 60

3. Find the cost per visit Plan #2.

Fees ÷ Number of Visits

$362 ÷ 60

$6.0333...........................(a) $6.03

4. Find the membership fees Plan #4.

Fees + Maintenance

$414 + (2 x $70).................. $554

5. Find the number of visits in 2 years.

60 x 2............................. 120

5. Find the cost per visit - Plan #4.

Fees ÷ Number of Visits

$554 ÷ 120

$4.6160...........................(b) $4.62

SUMMARY:

1. How do we compute the cost per visit to a health club?
2. What ways are there to reduce the cost per visit to a health club?

CONSUMER MATHEMATICS

LEISURE

LESSON: 12

AIM: How do we plan for the expenses involved in recreational activities? (i.e. tennis, hiking, etc.)

PERFORMANCE OBJECTIVES: The student will be able to...

1. List fees associated with a recreational activity e.g., bowling.
   a) Facility fees.
   b) Equipment fees.
2. Calculate the total recreation cost.

VOCABULARY: facilities fee

MOTIVATION:

Make a list of the recreational activities that you enjoy.

DEVELOPMENT:

1. Ask, "What do you think is the most popular recreational activity?"
   Elicit: The answer would be controversial and probably depends on the geographic area, the age, and the sex of the people asked. For example in Florida the answer might be swimming, while in Maine the answer might be skiing.
2. Ask, "How could you find out what the most popular recreational activities are in the United States?"
   Elicit: There are statistical surveys done for parties interested in businesses related to recreational activities. This information is often available in Almanacs but quickly becomes outdated as fads and the public's interests change.
3. Have the students record the recreational activities that are most popular in the class.

4. Using the list of recreational activities generated. Ask, "Which of these activities would be classified as relatively inexpensive and which would be classified as more expensive?"

5. Ask, "What questions should you ask when considering joining in a recreational activity?
Elicit: (1) What equipment is necessary and what is the cost of the equipment?
(2) What are the facilities fee and/or other fees required?

6. For example ask: "What are the costs of playing tennis?"
Elicit: (1) There can be membership fees to join a tennis club and additional fees for court time.
(2) It might be necessary to buy tennis racquets, sneakers, and clothes.

   * Note * If the students are interested in tennis you might estimate the costs and compute the total cost of the recreation.

7. Have the students find the solution to Application #1 for discussion.

8. Have the students solve Application #2.

9. Have the students solve Application #3.

10. Have the students solve Application #4.

APPLICATIONS:

1. Sal Gambino joins a bowling league that costs him $4.75 per week. The league lasts for 36 weeks. Sal purchased bowling equipment totaling $185.40. He paid $8\frac{1}{4}$% sales tax on his equipment purchases. What is the total recreation costs?

2. Peter Maharis has decided to learn to play golf. Each week he takes an hour golf lesson. The rate is $16.50 per half hour. The course fee is $6.50 and practice balls cost $3.25. Peter rents his golf clubs for $6.75 for the day. What is the total cost of his recreation?

3. Jack Sprat purchased racquetball equipment for $93.45, plus $8\frac{1}{4}$% sales tax. He contracts for 28 hours of court time at $12 an hour and 42 hours at $8.50. He receives a 10% discount for the court time as a promotional incentive. What is his total cost of recreation?

4. Elvira Jordan plays league basketball. His membership fee is $25. His new sneakers cost $48.95 and his uniform cost $33.95. The sales tax on his purchase is $8\frac{1}{4}$%. What is the total cost of his recreation?

SOLUTIONS TO APPLICATION PROBLEMS:

1. 1. Find the Facility Fee.
        36 x $4.75.................................. $171.00
    2. Find the Cost of Equipment.
        a) Selling Price...................... $185.40
        b) Sales tax: $8\frac{1}{4}$% of $185.40........ $ 15.30
        c) Total: $185.40 + $15.30.................. $200.70
    3. Find the Total Recreational Cost.
        Facility Fee + Cost of Equipment
        $171.00 + $200.70.................. $371.70

2. 1. Find the Facility Fee........................ $ 6.50
    2. Find the Cost of Lessons
        2 x $16.50.................................. $33.00
    3. Find the Cost of Equipment.
        a) Club rental...................... $6.75
        b) Practice balls................... $3.25
        c) Total.................................. $10.00
    4. Find the Total Recreational Cost.
        Facility Fee + Equipment Fee + Lessons
        $6.50 + $10.00 + $33.00........ $49.50

3. 1. Find the Facility Fee.

a) 28 x $12.00....................... $336.00
b) 42 x $8.50........................ $357.00
c) Total............................. $693.00
d) 10% Discount...................... $ 69.30
e) Total with Discount $693.00 - $69.30...... $623.70

2. Find the Cost of Equipment.

a) Selling Price..................... $93.45
b) Sales tax: $8\frac{1}{4}$% of $93.45......... $ 7.71
c) Total..................................... $101.16

3. Find the Total Recreational Cost.

Facility Fee + Cost of Equipment
$623.70 + $101.16.................. $724.86

4. 1. Find the Facility Fee.

a) Membership................................ $ 25.00

2. Find the Cost of Equipment.

a) Sneakers.......................... $48.95
b) Uniforms.......................... $33.95
c) Total............................. $82.90
d) Sales Tax: $8\frac{1}{4}$% of $82.90......... $ 6.84
e) Total with tax............................ $ 89.74

3. Find the Total Cost of Recreation.

Facility Fee + Equipment Fee
$25.00 + $89.74................... $114.74

SUMMARY:

1. What are the costs of a recreational activity?

2. a) Name some inexpensive recreational activities.
b) Name some expensive recreational activities.

CONSUMER MATHEMATICS

LEISURE

LESSON: 13

AIM: How do we estimate the cost of starting a hobby?

PERFORMANCE OBJECTIVES: The student will be able to...

1. List the cost associated with different leisure activities and hobbies e.g., gardening, cooking, listening to music.
2. Compute the cost of leisure activities and hobbies.

VOCABULARY: hobby, philatelist, numismatist

MOTIVATION:

Make a list of the leisure activities or hobbies that you enjoy doing in your home.

DEVELOPMENT:

1. Ask the students for their responses to the beginning exercise.
2. Generate a list of activities:
    a) listening to music
    b) sewing
    c) knitting
    d) photography
    e) cooking
    f) reading books
    g) gardening
    h) stamp collecting
    i) wood working
    j) antiques collecting
    k) coin collection
    l) solving crossword puzzles
    m) ham radio operator
3. Ask, "What is a hobby?"
   Elicit: A hobby is a favorite occupation, topic, etc. pursued for amusement.
4. Ask, "Which of the activities on our list would be relatively inexpensive?"
   Elicit: a) The cost of an activity can vary greatly depending on how involved one gets and the quality of any equipment involved.

   b) For example: Public libraries are a good source of books which makes reading inexpensive.

   c) The cost of gardening and knitting are also relatively expensive.

5. Ask, "How could you estimate the cost of starting a hobby?"
   Elicit: (a) A good source for this information would be hobby magazines and hobby shops.

6. Ask, "What costs might be involved in the listening of music?"
   Elicit: The cost in the listening of music would vary depending on the cost of the equipment, albums and/or cassettes.

7. Model with the students the solution to Application #1.

8. Have the students find the solution to Application #2.

9. Ask, "Which hobbies have turned into good investments?"
   Elicit: Coin collecting and stamp collecting have become lucrative investments and good businesses.

10. Ask, "What is a numismatist?"
    Inform the students: A numismatist is a coin collector. A stamp collector is a philatelist.

11. Have the students find the solution to Application #3.

APPLICATIONS:

1. So Young Park loves rock music. She is going to upgrade her stereo equipment. Her new system includes an AM/FM stereo receiver for $695, a cassette player for $433, and a pair of speakers for $489. The dealer will allow her $375 allowance on the trade-in of her old system. Including the $8\frac{1}{4}$% sales tax, what is the cost of her new system?

2. Eleanor Kosar plans to plant a garden in her backyard. She makes a list of the materials she will need to start and maintain her garden for the first year.

175 feet of wire fencing: $.64 per foot
1 6-foot gate: $19.95
13 fence posts: $2.10 each
1 tiller: $159.95
4 packets of seeds: $.69 each
2 packets of seeds: $.89 each
11 tomato plants: $1.49 each
1 bag of fertilizer: $65.00

What is Eleanor's costs to start and maintain the garden?

3. Betty Bangle restores 1950's automobiles as a hobby. She buys a 1956 station wagon for $425 plus $8\frac{1}{4}$% sales tax. Some mechanical work that she could not do herself cost $57 for labor and $123 for parts, plus $8\frac{1}{4}$% sales tax on the parts. She had some body work done for $375. Four new tire's cost $72 each plus 5% federal excise tax. Other parts cost $890 plus $8\frac{1}{4}$% sales tax. What did it cost her to restore the car?

SOLUTIONS TO APPLICATION PROBLEMS:

1. 1. Find the Cost of the Items.
        $695 + $433 + $489........................ $1617.00
    2. Find the Trade-In-Allowance................. $ 375.00
    3. Find the Total Cost.
        a) Selling Price: $1617 - $375............. $1242.00
        b) Sales tax: .0825 x $1242................ $ 102.47
        c) Total.................................. $1344.47

2. 1. Find the Cost of the Items.
        a) Fencing 175 x $.64...................... $112.00
        b) Gate.................................... $ 19.95
        c) Posts 13 x $2.10........................ 27.30
        d) Tiller.................................. 159.95
        e) Seeds: 4 x $.69......................... 2.76
        f) Seeds: 2 x $.89......................... 1.78
        g) Tomato: 11 x $1.49...................... 16.39
        h) Fertilizer.............................. 65.00
        Total...................................... 405.13

3. 1. Find the Cost of the Items.

a)	Station Wagon	$425.00	
	Sales Tax: .0825 x $425	35.06	
	Total		$460.06
b)	Mechanical Work.		
	Labor	$ 57.00	
	Parts	123.00	
	Sales Tax: .0825 x $123	10.15	
	Total		$190.15
c)	Body Work		$375.00
d)	Tires: 4 x $72	$288.00	
	Excise Tax: .05 x $288	14.40	
	Total		$302.40
e)	Other Parts	$890.00	
	Sales Tax: .0825 x $890	73.43	
	Total		$963.43

f) Find the Total Cost.

$460.06 + $190.15 + $375.00 + $302.40 + $963.43 = $2291.04

SUMMARY:

1. How do we compute the cost of starting a hobby?
2. What costs would be involved in taking up photography as a hobby?

CONSUMER MATHEMATICS

LEISURE

LESSON: 14

AIM: What is the golden rectangle?

PERFORMANCE OBJECTIVES: The student will be able to...

1. State various uses of the Golden Rectangle.
   a) Paintings
   b) Architecture
   c) Books
2. Using the numerical constant Ø = 1.618 compute the length and width of a rectangle in the "divine proportion".

VOCABULARY: Fibonacci Series, Divine Proportion, Ø, Golden Rectangle

MOTIVATION:

How many rabbits are born in a year if we:

1. Start with 1 pair in a pen.
2. Rabbits begin to bear after 2 months.
3. Every month a pair of rabbits produces another pair.

DEVELOPMENT:

1. Have The students develop and complete the following table:

END OF MONTH:	1	2	3	4	5	6	7	8	9	10	11	12
# PAIRS BORN:	0	0	1	1	2	3	5	8	13	21	34	55
TOTAL # PAIRS:	1	1	2	3	5	8	13	21	34	55	89	144

Ans. 143 pairs born

2. Ask, "Is there any pattern that you recognized when we filled out the table?"
   Elicit: Each successive term in the series is the sum of the two preceding terms.

3. Inform the students: In the thirteenth century, Leonardo of Pisa, more commonly called Fibonacci (son of Bonacci), was doing experimental work on rabbits and arrived at the now famous Fibonacci's Series:

   0, 1, 1, 2, 3, 5, 8, 13, 21, 34,...

4. Have the students do Application #1.

5. Inform the students: Biologists have found that the numbers in the Fibonacci Series are related to the spirals in the heads of flowers like sunflowers and daisies. In addition, if we study the buds of a bush or tree, we find the buds position themselves about the branch in a systematic pattern related to the Fibonacci Series.

6. Ask, "What are the decimal equivalents of the ratio of the numbers taken two at a time?"

7. Develop the following table with the students:

$\frac{0}{1} = 0$

$\frac{1}{1} = 1$

$\frac{1}{2} = .5$

$\frac{2}{3} = .666...$

$\frac{3}{5} = .6$

$\frac{5}{8} = .625$

$\frac{8}{13} = .61538...$

$\frac{13}{21} = .61904...$

$\frac{21}{34} = .61764...$

$\frac{34}{55} = .61818...$

$\frac{55}{89} = .61797...$

$\frac{89}{144} = .61805...$

$\frac{144}{233} = .61802...$

$\frac{233}{377} = .61803...$

$\frac{377}{610} = .61803...$

8. Ask, "Is there any pattern that we can observe?"
   Elicit: The ratios alternate around the value 0.618.

9. Inform the students: The Greeks believed that the ideal ratio or "divine proportion" was the ratio of the length and width of a rectangle which was most pleasing to the eye. They found this ratio to be 1.618 and named it the Greek letter Ø. A rectangle whose dimensions are in this ratio is called a "Golden Rectangle".

10. Ask, "How does the Golden Rectangle relate to the Fibonacci Series?"
    Have the students find the reciprocal of 1.618.
    $\frac{1}{1.618} = 0.618$ from the Fibonacci Series.

11. Ask, "What shape is most commonly used for billboards or posters?"
Elicit: Most billboards or posters are Golden Rectangles.

12. Ask, "Why use Golden Rectangles?"
Elicit: The eye can study a Golden Rectangle in a single glance while other rectangles must be scanned.

13. Ask, "In what other fields are Golden Rectangles used?"
Illustrate: 1) In architecture the front structure of the Parthenon and the main doorway of the Cathedral of Charters are designed as Golden Rectangles. The chambers of the pyramids were designed with doorways and walls as Golden Rectangles.
2) In art, artists drew and sculptured parts of the human body to the proportion of a Golden Rectangle. For example, Durer in his painting Adam and Eve and modern artist Salvador Dali in his painting "Corpus Hypercubus" make use of the divine proportion.

14. Have the students find the solutions to Applications #2-#4. In the ensuing discussion emphasize the use of the Golden Rectangle.

APPLICATIONS:

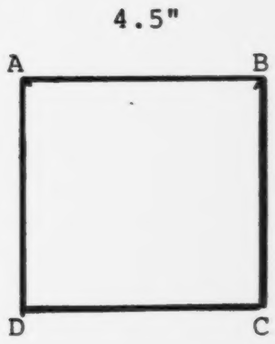
1. Find the next five terms in the Fibonacci series.
   0, 1, 1, 2, 3, 5, 8, 13, 21, 34,...
2. A printed page in a Social Studies textbook is $4\frac{1}{2}$" wide across. If the printer wants the printed lines to be easiest on the eye, what should the height be from the top line to the bottom line?
3. A television manufacturer has developed a new projection screen. The rectangular screen has a vertical height of 15 inches. What should be the horizontal dimension of the screen if it is to be most pleasing to the eye?
4. You are asked to design a billboard advertising a Dental Center. The width of the billboard is 25 feet. What should be the vertical length of the billboard so that it might be seen at a single glance by a passing motorist?

SOLUTIONS TO APPLICATION PROBLEMS:

1. 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 21+34,
55, 34+55
89, 55+89
144, 89+144
233, 144+233
377

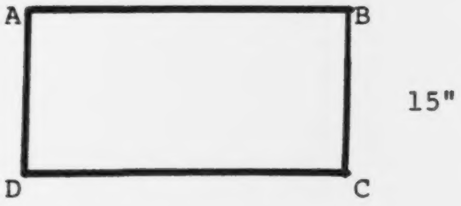
Solution 55, 89, 144, 233, 377,...

2.



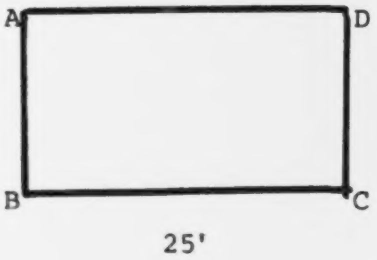
BC = 4.5 x Ø
= 4.5 x 1.618
= 7.281 inches

3.



AB = 15" x Ø
= 15" x 1.618
= 24.27 inches

4.



CD = 25' x $\frac{1}{Ø}$
= 25 x .618
= 15.45 feet

Point out that we would like BC to be greater than CD and thus we multiply by 1/Ø.

SUMMARY:

1. What is the Golden Rectangle and why is it significant?
2. What uses of the Golden Rectangle can you list?

CONSUMER MATHEMATICS

LEISURE

LESSON: 15

AIM: What factors should we consider in buying a personal computer?

PERFORMANCE OBJECTIVES: The student will be able to...

1. List three different types of computers.
2. Define hardware, software, and peripherals.
3. Define RAM, ROM, BYTES, KILOBYTES.
4. List 5 uses of a computer.
5. Compute the cost of a home computer system.

VOCABULARY: hardware, software, peripherals, RAM, ROM, BYTES, KILOBYTES

MOTIVATION:

Distribute Worksheet #1.

DEVELOPMENT:

1. Ask: "If you were a salesperson, which system would you recommend for each of these three customers?"
   Elicit: "The purchase must fit ones needs."
2. Ask: "What types of computers are used?"
   Inform the students:
   (a) Mainframe computers - large computers costing hundreds of thousands of dollars used by large businesses, government agencies, and universities to store large amounts of information. They are capable of handling many jobs at one time.
   (b) Minicomputers - smaller than mainframes, costing about 10 to 100 thousand dollars used by medium and small companies, school systems, banking departments, and other terminal users. They can also handle several jobs at one time.

(c) Microcomputers - personal or home computer cosing less than $6000, portable, does one job at a time.

3. Ask: "What purposes might a person purchase a computer?" Elicit: Some responses might be:
   - (i) playing games
   - (ii) learning to program
   - (iii) keeping personal records
   - (iv) word-processing
   - (v) learning new skills
   - (vi) using an electronic information service

4. Ask: "What are the various components that can be purchased?" Elicit:
   - (a) The equipment is called the hardware. Examples: keyboard, central processing unit (CPU), monochrome display, color monitor, disk drive, printer, tape drive, expanded memory capacity.
   - (b) Software is the instructions that make the hardware work. (Programs)
   - (c) Peripherals are hardware devices such as light pens, joysticks, printers, music generators, etc.

5. Ask: "How is information stored in a personal computer?" Elicit: Information is stored in the memory of the CENTRAL PROCESSING UNIT. There are two kinds of memory:
   - (i) ROM (Read Only Memory) permanently stored and cannot be changed.
   - (ii) RAM (Random Access Memory) temporarily stored and can be changed.

6. Ask: "Where is a program stored?" Elicit: "A program is stored in RAM while it is being used. Memory is measured in bytes. A kilobyte (1k) memory contains 1024 bytes. Cassettes and floppy disks can be used for storage of programs and information while not in use.

7. Have the students do Application #1.

8. Ask: "What questions would you consider before making an informed purchase of a personal computer?" Elicit:
   - (1) What are your reasons for buying a home computer?
   - (2) How sophisticated should the system be to meet your needs?

(3) Can the system be upgraded to meet future needs?

(4) How much money can you spend and how do you get the most for your money?

(5) Do you know someone who has a similar system?

(6) What software is available for the brand computer you are considering purchasing?

(7) Distribute Worksheet #2 and discuss the several criteria to compare the suitability of one brand to another.

(8) Have the students do Applications #2 - #4.

APPLICATIONS:

1. How many bytes are there in a 64k memory?
2. Po Lee bought a CPU with a keyboard and 48k memory for $759. A color monitor will cost $430. The disk drive is $425 and a printer is $609. Po is also going to spend $233 for software. There is no sales tax. What is the total cost?

COMPSHARE COMPUTER PRICE LIST

CPU with keyboard and 48k memory, compatible with any TV set: $795

Peripherals		Software	
16k - add on memory	$ 95	Home budget program	$145
Disk drive	$440	Stock market portfolio evaluator	$ 75
Printer	$540	Graph and chart maker	$ 69
Music generator	$270	Arithmetic tutor	$ 39
Light pen	$279	Space game	$ 40
Game paddles	$ 45	Chess game	$ 35

3. Ashley Jagoda, a computer graphics consultant, buys a Compshare computer system to work on at home. He purchased a CPU with keyboard and 48k memory, a 16k add on memory, a disk drive, a light pen, a graph and chart maker, and a chess game. There is 8% sales tax. What is the total cost?
4. You are planning to purchase a Compshare computer system to help with your budget and for recreation. You are

considering buying the CPU with keyboard and 48k memory, the printer, the light pen, game paddles, home budget program, space game, and chess game. There is 8% sales tax.

(a) What input devices do you have?
(b) What output devices will you have?
(c) How many bytes of memory will you have?
(d) What will the total cost be?

SOLUTIONS TO APPLICATION PROBLEMS:

1. 1k = 1024 bytes
   64k = 64 · 1024 = 65,536 bytes

2. HARDWARE

CPU with keyboard, 48k memory	$ 759
Color Monitor	$ 430
Disk Drive	$ 425
Printer	$ 609
SOFTWARE	$ 233
Sales Tax	$ 0
Total Cost	$2456

3. Using the price list:

HARDWARE	
CPU with keyboard, 48k memory	$ 795
16k add on memory	$ 95
Disk Drive	$ 440
Light pen	$ 279
Subtotal	$1609
SOFTWARE	
Graph and chart maker	$ 69
Chess game	$ 35
Subtotal	$ 104
Total Purchase	$1713
Sales Tax: 8% of $1713	$ 137.04
Total Cost	$1850.04

4. (a) The input devices are the keyboard, the light pen and the game paddles.
   (b) The output devices are the printer and probably a television set.
   (c) 1k = 1024 bytes
   48k = 48 · 1024 = 49.152 bytes
   (d) HARDWARE

CPU with keyboard, 48k memory	$ 795
Printer	$ 540
Light pen	$ 279
Game paddles	$ 45
Subtotal	$1659
SOFTWARE	
Home budget program	$ 145
Space game	$ 40
Chess game	$ 35
Subtotal	$ 220
Total Purchase	$1879
Sales Tax: 8% of $1879	$ 150.32
Total Cost	$2029.32

SUMMARY:

1. What factors would determine the computer components you will purchase for a home system?
2. What equipment would you purchase if you wanted to do your banking at home using a computer system?
3. How would you use a computer to store your personal records?

WORKSHEET - I

Instructions: Read this worksheet carefully and arrive at the decision requested. You and your classmates will discuss your decisions as part of the lesson.

Three customers have come into Weird Melvin, a famous stereo and audio dealer. Each customer intends to purchase a sound system that would suit his or her needs. Can you help them by matching the systems described in Column B with the customers described in Column A?

Column A	Column B
Jose - A construction worker. He wants to be able to listen to his favorite music while he works.	System "A" - · automatic favorite · 11-inch bookshelf speakers · AM/FM mini-tuner amplifer · mini-stereo cassette · player which connects to amplifier
Margaret - A professional musician. She was trained at the Juilliard School of Music She requires absolute perfection and realism. Money is no object.	System "B" - · one-piece AM/FM stereo stereo cassette player with attached earphones.
Donald - A college freshman. He wants a system that he can use both in his dormitory room and also in his room at home. He wants a fairly realistic sound. He has a moderate amount of money to spend.	System "C" - · twin speakers, each 35-inches high · dual stereo tape deck with push-button controls and LED meters · linear-tracking direct-drive turntable · digital synthesized, 100 watt per channel receiver · 7-band equalizer with LED read-out

WORKSHEET -II

Instructions: This worksheet will be used to evaluate two different brands of personal computers. You may obtain your answers by reading newspaper advertisements or magazine advertisements and by visiting stores in which the computers are sold.

Information to be found	Answers: Brand - 1 Name:_____	 Brand - 2 Name:_____
1. Cost of Basic Computer (keyboard, processor)		
Monitor included?		
If extra, cost of monitor		
2. Memory Size (in "K" or Kilobytes)		
RAM (usable memory)		
ROM (non-usable memory)		
Can memory be upgraded?		
Cost to upgrade		
3. Color Capability (yes/no)		
How many colors available?		
How many colors displayed at one time?		
4. Graphics Capability (yes/no)		
High-resolution graphics?		
Special graphics commands?		
5. Peripheral Devices		
Disk Drive included?		
Disk Drive available?		
Cost to add Disk Drive		
Cost of Tape Drive		
Printer Available?		
Cost		
6. Software		
Type of Software available		
Average cost of software		

CONSUMER MATHEMATICS

LEISURE

LESSON: 16

AIM: What are the basic Basketball Statistics recorded?

PERFORMANCE OBJECTIVES: The student will be able to...

1. State three uses of basketball statistics (team and individual records, salaries, etc.)
2. Define field goals made-attempted, free-throws attempted-made, rebounds, assists.
3. Compute field-goal percentage, free-throw percentages and rebounding and scoring averages.

VOCABULARY: Assists, field-goals, free throws, rebounds, steals, turnovers, boxscore

MOTIVATION:

One N.B.A. coach, Jack Ramsay uses statistics and believes almost every game can be determined by 3 key percentages. Read the article and determine which are the coaches "3 key stats".

DEVELOPMENT:

After the students have read the article

1. Ask: "What are the "3 key statistics" Coach Ramsay stresses?
   Elicit: a) A field-goal percentage of better than 50% for Portland's players.
   b) A free-throw percentage of better than 80% for Portland's players.
   c) The opponents field goal shooting percentage should be kept to 45% or less.
2. In order to determine whether Coach Ramsay's goals were met, Ask: "What formulas do we need?"
   Elicit: a) Field-Goal Percentage = $\frac{\text{field goals made}}{\text{field goals attempted}}$

3. Have students do application Number #1.

4. Sometimes one or two "hot" players can dominate a game by their accurate scoring.
   Ask: Did any of L.A.'s players shoot extremely accurate this game?
   Elicit: Rambis, Worthy, Jabbar, Johnson, Wilkes, McGee, Spriggs, Lester

5. Have students do application Number #2.

6. Ask: "Do any of Portland's players need free-throw shooting practice.
   Elicit:
   a) Drexler
   b) Kersey
   c) Norris
   d) (possibly) M. Thompson

7. Have students do Application Number #3.

8. Another important statistic not recorded in the Portland vs. Los Angeles game is rebounding.
   Ask: What is the difference between an offensive rebound and a defensive rebound?
   Elicit: an offensive rebound results when a teammate rebounds another teammates' (or his own) shot.
   a defensive rebound results when a player rebounds an opponents missed shot.

9. Refer to Nets vs. Boston Boxscore:
   Ask: If field-goals = 2 points and free-throws = 1 point, how did Bird get 26 points on 9 field-goals and 7 free-throws?
   Elicit: He made one 3-point goal.

10. Ask: Did anyone else for either Boston or the Nets make a 3-point goal?
    Elicit: Wedman, Birdsong, Ransay, Johnson

11. The Nets-Boston boxscore also list another important statistic not counted by Coach Ramsay.
    Ask: What is an assist?
    Elicit: A pass that immediately leads to a field goal.

12. Ask: Why are assists so important?
    Elicit: An assist usually results in an easy field-goal.

13. Ask: What is a steal?
    Elicit: When the ball is taken-away from the opposition.

14. What is a turnover?
    Elicit: When a player loses the ball by a steal or bad pass etc.

15. Ask: What statistic not found in a box-score would reflect ball-handling ability?
    Elicit: A steal to turnover ratio.

16. Do Application Number #4.

17. Ask: Does Bird's poor turnover to steal ratio mean he is a poor ballplayer?
    Elicit: He just handles the ball a great deal.

APPLICATIONS

Portland vs. Los Angeles

Portland	fg m-a	ft m-a	Total Points
Drexler	4-13	2-4	10
M. Thompson	6-12	12-15	24
Bowie	2-10	0-0	4
Paxson	7-13	0-1	14
Valentine	2-8	4-5	8
Vandewghe	7-12	3-3	17
Kersey	8-13	2-7	18
Norris	1-3	1-2	3
Colter	2-6	0-0	4
B. Thompson	2-3	0-0	4
Scheffler	0-0	0-0	0
	41-93	24-37	106

Los Angeles	fg m-a	ft m-a	Total Points
Rambis	3-3	2-2	8
Worthy	9-16	0-0	18
Jabbar	11-15	7-7	29
Cooper	5-11	3-3	13
Johnson	6-10	0-0	12
Wilkes	11-14	2-2	24
McGee	2-2	0-0	4
Spriggs	3-4	0-0	6
McAdoo	2-6	0-0	4
Lester	2-2	0-0	4
	54-83	14-14	122

Legend: fg = field goals ft = free throws;
m = successfully made a = attempted

1. Using the box score provided, find:
   a) Portland's field-goal percentage
   b) Portland's free-throw percentage
   c) The opponent's field-goal percentage

2. For each L.A. Player in the Lineup who played more than 16 minutes, find the shooting (field-goal percentage)

3. For each Portland player, determine their free-throw percentages. Make a list of all players Coach Ramsay will ask to report to practice early to shoot foul shots.

4. For each player below, compute a steal to turnover ratio:
   a) Gminski
   b) Ransay
   c) Birdsong
   d) Carlisle
   e) Bird

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) $\text{f.g. pct.} = \frac{\text{f.g. made successfully}}{\text{f.g. attempted}} = \frac{44}{93} = 44.09\%$

   b) $\text{f.t. pct.} = \frac{\text{f.t. made successfully}}{\text{f.t. attempted}} = \frac{24}{37} = 64.86\%$

   c) $\text{L.A. f.g. pct.} = \frac{54}{83} = 65.06\%$

2. Rambis $\frac{3}{3} = 100\%$

   Worthy $\frac{9}{16} = 56.25\%$

   Jabbar $\frac{11}{15} = 73.33\%$

   Cooper $\frac{5}{11} = 45.45\%$

   Johnson $\frac{6}{10} = 60\%$

   Wilkes $\frac{11}{14} = 78.57\%$

   Spriggs $\frac{3}{4} = 75\%$

3. *Drexler $\frac{2}{4} = 50\%$

   M.Thompson $\frac{12}{15} = 80\%$

   *Paxson $\frac{0}{1} = 0\%$

   Valentine $\frac{4}{5} = 80\%$

   Vandewghe $\frac{3}{3} = 100\%$

   *Kersey $\frac{2}{7} = 28.57\%$

   Norris $\frac{1}{2} = 50\%$

   * = Early To Practice

4. a) Gminski 3:2 = 1.5:1

   b) Ransay 2:2 = 1:1

   c) Birdsong 1:1 = 1:1

   d) Carlisle 2:2 = 1:1

   e) Bird 2:5 = .4:1

Summary:

Explain why, citing at least 5 key statistics, how Boston easily defeated the Nets.

WINNING WITH STATISTICS

Coach Jack Ramsay uses numbers to chart his team's success.

What's the secret to winning basketball games? "Statistics," says Jack Ramsay. Ramsay is the coach of the Portland Trail Blazers in the National Basketball Association (NBA). When it comes to winning, he's an expert.

Jack Ramsay has been coaching in the NBA for 17 years. During that time, his teams have won more than 700 games. That makes Ramsay the coach with the most wins in the NBA today--and the second most wins in NBA history.

During every NBA game, coaches and statisticians produce stacks of data. But some statistics tend to be more important than others. Ramsay told MATH, "Over the years, we've made notes of those statistics that stand out when you win games.

"We set certain statistical goals that we try to meet each game," he continued. "Winning is a combination of things, and no one statistic is going to save or sink you. But if we met all our statistical goals, we'd be undefeated."

Ramsay and his assistants have pinpointed 12 key statistics that they watch for. At the top of the list, Ramsay told us, are shooting percentages.

"There are three percentages we think we need to win," Ramsay said. "We want our players to make over 50% of their field-goal* attempts. We also want our players to make more than 80% of their free throws.** And we want to keep our opponenets from making more than 45% of their field goals."

As MATH went to press, the Trail Blazers were fighting to make the NBA playoffs. They were also fighting to meet Coach Ramsay's statistical goals.

* Field goals are shots made while play is in progress.

** Free throws are shots made after fouls are committed.

Remember Jack Ramsay's three key stats:

- **A field goal shooting percentage of better than 50% for Portland's players.**
- **A free-throw shooting percentage of better than 80% for Portland's players.**
- **The opponent's field goal shooting percentage should be kept to 45% or less.**

Portland vs. Los Angeles

Portland	fg m-a	ft m-a	Total Points
Drexler	4-13	2-4	10
M. Thompson	6-12	12-15	24
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Paxson	7-13	0-1	14
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Norris	1-3	1-2	3
Colter	2-6	0-0	4
B. Thompson	2-3	0-0	4
Scheffler	0-0	0-0	0
	41-93	24-37	106

Los Angeles	fg m-a	ft m-a	Total Points
Rambis	3-3	2-2	8
Worthy	9-16	0-0	18
Jabbar	11-15	7-7	29
Cooper	5-11	3-3	13
Johnson	6-10	0-0	12
Wilkes	11-14	2-2	24
McGee	2-2	0-0	4
Spriggs	3-4	0-0	6
McAdoo	2-6	0-0	4
Lester	2-2	0-0	4
	54-83	14-14	122

Key: fg = field goals ft = free throws; m = successfully made
a = attempted

AT BOSTON

NETS(107)

		FG	FT	Reb			
	Min	M A	M A	O-T	A	PF	Pts
O'Koren	29	4-12	0-0	1-3	2	5	8
B. Williams	24	5-6	2-6	2-10	0	6	12
Gminski	33	7-18	4-4	5-8	0	2	18
Birdsong	29	8-14	2-5	3-5	4	3	19
Ransey	20	3-10	0-0	0-1	5	3	7
King	27	5-13	2-2	1-4	3	2	12
Turner	19	3-7	1-2	4-6	0	2	7
Cook	18	0-6	1-2	0-0	2	2	1
M. Johnson	23	4-13	1-1	2-4	4	5	10
R. Williams	10	3-6	3-4	0-0	2	3	9
Cattage	8	1-3	2-2	1-2	0	1	4
Totals	240	43-108	18-28	19-43	22	34	107

Percentages: FG .398, FT. 643. 3-Point Goals: 3-4, .750 (Birdsong 1-1, Ransey 1-1, M. Johnson 1-1, Cook 0-1). Team Rebounds: 13 Blocked Shoots: 2 (O'Koren, B. Williams). Turnovers: 12 (King 3, Ransey 2, M. Johnson 2, Gminski 2, Birdsong, R. Williams, Cattage). Steals: 13 (Gminski 3, Ransey 2, R. Williams 2, Turner 2, O'Koren, Cook, Cattage, Birdsong). Technical fouls: Gminski, 2nd 1:24;, illegal defense, 2nd 10.48. illegal defense: 1.

BOSTON (135)

		FG	FT	Reb			
	Min	M A	M A	O-T	A	PF	Pts
McHale	23	11-13	2-3	2-9	3	1	24
Bird	37	9-14	7-7	0-4	3	2	26
Parish	28	3-10	5-7	1-13	3	2	11
D. Johnson	29	4-6	4-4	0-2	4	3	12
Ainge	30	1-4	11-12	1-1	4	3	12
Walton	13	1-4	2-2	2-7	2	0	4
Sichting	19	3-4	4-4	0-1	3	1	10
Kite	18	1-2	2-2	0-5	0	4	4
Calisle	16	4-6	2-2	0-3	1	1	10
Wedman	18	3-8	2-2	0-4	1	1	9
Vincent	8	1-1	2-2	0-0	2	3	4
Thirdkill	7	3-3	2-2	0-0	0	0	8
Totals	240	44-75	45-51	6-49	26	21	135

Percentages: FG .587, FT .862. 3-Point Goals: 2-4, .500 (Bird 1-1, Wedman 1-1, D. Johnson 0-2). Team Rebounds: 7 Blocked Shots: 7 (McHale 2, Parish, Walton, Bird, Kite, Carlisle). Turnovers: 20 (Bird 5, D. Johnson 3, Kite 2, Carlisle 2, D. Johnson 2, McHale Parish, Walton, Sichting, Wedman, Vincent). Steals: 7 (Birds 2, Carlisle 2, McHale, Parish). Technical fouls: None. Illegal defense: None.

Nets.................................... 23 29 27 29--107
Boston.................................. 23 28 46 38--135

A-14,820, T-2:00. Officials-Dick Bavetta. Joe Crawford.

CONSUMER MATHEMATICS

LEISURE

LESSON: 17

AIM: How do we read a baseball box score?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Read a baseball box score from a newspaper to determine:
   a) bats, runs, hits, runs batted in errors
   b) innings pitched, hits, runs, earned runs, walks, strikeouts
2. Compute team totals, batting averages and earned run averages.

VOCABULARY: at bats, runs, hits, runs batted in, errors, earned runs, batting average, and earned run average

MOTIVATION:

Your copy of today's newspaper was ruined by the rain and you did not get a chance to read the article about yesterday's baseball game.

What important information can you derive from the boxscore?

DEVELOPMENT:

1. Ask: "If you only had the bottom of the boxscore (below the inning-by-inning score), how could you determine who won the game?
   Elicit: If we look at the pitching section, we can see how many runs were scored by each team.
2. Ask: What is the difference between Runs and earned runs?
   Elicit: Runs = total scored off each pitcher
   Earned Runs = only those scored off without the aid of a fielder's miscue (error)
3. Ask: For the boxscores provided at the end of this lesson how many hits did each team get?

Elicit: a) Milwaukee = 11
b) K.C. = 4
c) California = 12
d) Yankees = 11

4. Ask: How can we account for the fact that Milwaukee and the Yankees both get 11 hits yet the Yankees scored more runs?
Elicit: The only extra base hits were doubles by Ready, Sveum and Schroeder (2) but the Yankees had 2 Home-runs in addition to 6 Base-on-balls.

5. Ask: What is an official at bat?
Elicit: An official at bat is an at bat where the batter does not: a) walk b) H.P.B c) Sac. d) Sac. Fly

6. Do Application Number 1.

7. Ask: Is there any circumstance(s) where the total number of outs for a team will not be 27?
Elicit: a) Home team wins after $8\frac{1}{2}$ innings.
b) Rain shortened game.
c) Home team wins in the bottom of the 9th
    1) with only 1 out or
    2) with only 2 outs.
d) Extra innings.

8. Usually on television when a boxscore is shown, the pitcher who pitches for 5 full innings and also retires 2 batters is listed as 5.2 innings pitched.
Ask: How should this be reported in the newspaper boxscore?
Elicit: $5\frac{2}{3}$

9. Ask: In order to determine a pitcher's effectiveness, we compute an earned run average. "Upon how many innings is an E.R.A. based?"
Elicit: 9 innings

10. Ask: "How can we develop a formula for computing Earned Run Average?
Elicit: $\frac{\text{EARNED RUNS}}{{}^{*}\text{INNING PITCHED}} = \frac{\text{E.R.A.}}{9}$

* Use Fractions $\frac{1}{3}$, $\frac{2}{3}$ not .1 or .2

11. Do Application number 2.

12. A Batting Average is computed by dividing the number of hits by (a) total at bats.
Ask: Would a team Batting Average be computed in the same or different way?
Elicit: Same
Team B.A. = $\frac{\text{total hits}}{\text{total at bats}}$

13. Do Application number 3.

14. Ask: Of all hitters which had the best day yesterday?

Elicit:		
	Riles	3 for 4
	Easler	3 for 3
	Grich	2 for 2
	Hendrick	2 for 5
	Joyner	2 for 5
	Deer	2 for 4
	Schroeder	2 for 4
	Sveum	2 for 4
	Henderson	1 for 1
	Roenicke	1 for 1
	Randolph	1 for 2

APPLICATIONS:

1. If each team had 27 outs, use the statistics below to find the number of runs scored:

	Milwaukee	K.C.	California	Yankees
Official At Bats (AB)	35	29	37	36
Walks (BB)	1	3	3	6
Sacrifice Bunts (S)	0	0	0	1
Sacrifice Fly (SF)	1	0	1	0
Hit By Pitch (HBP)	1	1	0	1
Left-On-Base (L.O.B.)	7	6	6	10
Total Outs (1.P.x3)	27	27	27	27
Runs				

2. Find the E.R.A. for each player listed below:
   - a) Witt
   - b) J. Nickro
   - c) Righetti
   - d) Darwin
   - e) Liebrandt

3. Find the Team Batting Average for
   - a) Milwaukee
   - b) Kansas City
   - c) California
   - d) Yankees

   for yesterday's games.

SOLUTIONS TO APPLICATION PROBLEMS:

1. No. Of Runs = Official A.B. + Walks + Sac. Bunts + Sac. Flies + HBP - L.O.B. - Total Outs

   Milwaukee = 35 + 1 + 0 + 1 + 1 - 7 - 27 = 4
   Kansas City = 29 + 3 + 0 + 0 + 1 - 6 - 27 = 0
   California = 37 + 3 + 0 + 1 + 0 - 6 - 27 = 8
   Yankees = 36 + 6 + 1 + 0 + 1 - 10 - 27 = 7

2. $\frac{\text{EARNED RUNS}}{\text{INNINGS PITCHED}} = \frac{\text{E.R.A.}}{9}$ Let E.R.A. = x

   a) Witt: $\frac{7}{8\frac{1}{3}} = \frac{x}{9}$ → 7.56

   b) J.Nickro: $\frac{3}{5\frac{1}{3}} = \frac{x}{9}$ → 5.06

   c) Righetti: $\frac{2}{1} = \frac{x}{9}$ → 18.00

   d) Darwin: $\frac{0}{9} = \frac{x}{9}$ → 0.00

   e) Liebrandt: $\frac{4}{3\frac{2}{3}} = \frac{x}{9}$ → 9.82

3. Batting Average = hits/at bats

   a) Milwaukee 11/35 → .314
   b) Kansas City 4/29 → .138
   c) California 12/37 → .324
   d) Yankees 11/36 → .306

SUMMARY:

Why is it impossible to compute an E.R.A. for

a) Holland?

b) Fisher?

If you were a person who bets, who would you bet on the next time Darwin pitches for Milwaukee vs. Kansas City? Why?

ANGELS 8, YANKEES 7

CALIFORNIA	ab	r	h	bi	YANKEES	ab	r	h	bi
Pettis cf	4	1	1	0	Griffey cf	5	0	1	0
Burlesn ph	1	0	0	0	Rndlph 2b	2	2	1	0
RJones lf	2	1	0	0	Mtngly 1b	3	1	1	1
Downing lf	2	1	0	0	Pasqua lf	4	0	0	0
Joyner 1b	5	1	2	2	Easler rf	3	2	3	3
RJcksn dh	2	1	0	0	RHndsn cf	1	0	1	0
Miller cf	1	0	1	0	Hassey dh	4	1	1	3
Hendrck rf	5	2	2	3	Winfild ph	1	0	0	0
DeCncs 3b	4	1	1	2	Pglrulo 3b	4	0	0	0
Wilfong 2b	2	0	0	0	Roenck ph	1	0	1	0
Grich 2b	2	0	2	0	Wynegar c	5	0	1	0
Schofild ss	3	0	1	1	Mechmss	3	1	1	0
Boone c	4	0	1	0					
Totals	**37**	**8**	**12**	**8**	**Totals**	**36**	**7**	**11**	**7**

California	**010 005 002-8**
Yankees	**301 000 210-7**

Game Winning RBI - Joyner (6).

DP-California 1, Yankees 1, LOB-California 6, Yankees 10. 2-Hendrick, DeCinces, Miller. HR-Easler (3), Hendrick (6), Hassey (2), Joyner (16). SB-Pettis 2 (8), S-Pasqua. SF-Schofield.

	IP	H	R	ER	BB	SO
California						
MWitt W,4-4	8 1-3	10	7	7	6	8
ForsterS,1	2-3	1	0	0	0	0
Yankees						
JNiekro	5 1-3	4	3	3	2	0
Holland	0	0	1	1	1	0
Fisher	0	2	2	2	0	0
Shirley	2 2-3	3	0	0	0	1
Righetti L,4-2	1	3	2	2	0	0

Holland pitched to 1 batter in the 6th, Fisher pitched to 2 batters in the 6th. HBP-Meacham by MWitt. WP-MWitt.

Umpires-Home, Clark; First, Schulock; Second, Morrison; Third, McKean. T-3:04. A-30,475.

Brewers 4, Royals 0

MILWAUKEE

	ab	r	h	bi
Gantnr 2b	4	0	0	0
Ready 1f	4	1	1	0
Hsehldr 1f	3	0	1	0
Cooper 1b	3	0	1	0
Schroedr c	4	1	2	0
Sveum 3b	4	1	2	1
Oglivie dh	4	0	0	1
Deer rf	4	1	2	1
Riles ss	4	0	3	0
Manning cf	3	0	0	1
Totals	**35**	**4**	**11**	**4**

KANSAS CITY

	ab	r	h	bi
Wilson cf	3	0	0	0
Orta dh	4	0	0	0
Law 1f	4	0	1	0
Brett 3b	2	0	1	0
White 2b	4	0	1	0
Sundbrg c	4	0	0	0
Balboni 1b	3	0	0	0
Motley rf	3	0	0	0
ASalazr ss	2	0	1	0
Totals	**29**	**0**	**4**	**0**

Milwaukee	**100 300 000-4**
Kansas City	**000 000 000-0**

Game Winning RBI - Sveum (1)

DP-Milwaukee 2, Kansas City 1, LOB-Milwaudee 7, Kansas City 6. 2B-Ready, Sveum, Schroeder 2, Brett, ASalazar, Law. SF-Manning.

	IP	H	R	ER	BB	SO
Milwaukee						
Darwin W,3-1	9	4	0	0	3	5
Kansas City						
Lelbrandt L,4-3	3 2-3	0	4	4	0	2
Farr	4 1-3	1	0	0	1	2
Quisnbry	1	2	0	0	0	0

HBP-ASalazar by Darwin, Gantner by Lelbrandt.

Umpires-Home, Brinkman; First, Kaiser; Second, Cooney; Third, Palermo. T-2:21. A-40,037.

CONSUMER MATHEMATICS

LEISURE

LESSON: 18

AIM: What are the costs and benefits of a higher education?

PERFORMANCE OBJECTIVES: The student will be able to...

1. State the benefit of a higher education.
2. Compute annual expenses of a higher education based upon tuition, fees, books, and supplies, room and board, and other miscellaneous expenses.

VOCABULARY: Matriculate, tuition, room and board

MOTIVATION:

Marvin Urquard is a senior at Francis Lewis High School. He has a high school average of 87.2 and has been accepted to the following universities:

Luther College (Iowa)
Emory University (Georgia)
St. John's University (N.Y.)
C.U.N.Y.: Queens College
Westminster Choir College (N.J.)
Kay Pardoll's Albuquerque Beauty College (New Mexico)

What are some of the financial aspects of going to college that Marvin will have to discuss with his parents before making his final decision?

DEVELOPMENT:

1. Ask: "What are some of the decisions that will have to be made by the Urquards?
   Elicit: a) Will Marvin go away to school or stay home?
   b) How much will each school cost per year?
2. Ask: If we just choose by tuition alone, what would be the order from least to most expensive.
   Elicit: 1) Queens 2) Kay Pardoll's 3) St. John's
   4) Luther 5) Westminster 6) Emory

3. Ask: Are there any other expenses we must take in account?

   Elicit: Books and supplies, room and board, transportation, other (Clothing, laundry, entertainment, incidental meals, medical insurance, and furnishings).

4. Do application number 1.

5. Ask: By what percent did the Total Expenses go up at Emory?

   Elicit: (13,359.50 = 12,360) ÷ 12,360 = 8%

6. Ask: "If items went up either 10% or 5%, how come the total increase was 8%?

   Elicit: This is a weighted increase.

7. Do application number 2.

8. If Marvin decides to stay home, his parents can afford tc buy him a car. If the total cost of the car is $9,034, what are some other expenses that Mr. Urquard will have to pay as "upkeep" on the car?

   Elicit: Fuel, insurance, minor maintenance etc.

9. Do application number 3.

APPLICATIONS

1. Using the figures provided at the end of the lesson determine the cost for academic year 1985-1986 for Emory University if tuition goes up 10% per year and all other costs go up by 5%?

2. Assume that only the tuition in each school has gone up by 10%; prepare a table of costs for the out-of-town colleges only:

3. Marvin has decided to study Statistics and Operations research at St. John's University but because of the higher tuition, Marvin will have to take public transportation. Determine his expenses for the 4 years at school if tuition goes up each year by 5% and all other expenses go up 10% annually. Note: Marvin will start in 1986.

SOLUTIONS TO APPLICATIONS PROBLEMS:

1. Emory University

	1984-1985	1985-1986
Tuition	7,630	8,393
Books/Supp.	300	315
Room/Board	3,200	3,360
Trans.	600	630
Other	630	661.50
Total	$ 12,360	$ 13,359.50

2.

	Emory	Luther	Westminister	Kay Pardell's
Tuition	8,393	6,572.50	6,934.40	3,346.20
Books/ Supplies	300	250	310	260
Room/Board	3,200	2,025	2,846	1,600
Trans.	600	250	100	825
Other	630	250	625	1,261
Total	$ 13,123	$ 9,347.50	$ 10,825.40	$ 7,292.20

3.

	St. John's University		1st Yr.	2nd Yr.	3rd Yr.	4th Yr.
	1984-1985	1985-1986	1986-1987	1987-1988	1988-1989	1989-1990
Tuition	4,250	4,462.50	4,685.63	4,919.91	5,165.91	5,424.21
Books/ Supplies	300	330	363	399.30	439.23	483.15
Room/Board	1,400	1,540	1,694	1,863.40	2,049.74	2,254.71
Trans	400	440	484	532.40	585.64	644.20
Other	600	660	726	798.60	878.46	966.31
Total	$ 6,950	N.A.	$ 7,952.63	$ 8,513.61	$9,118.98	$9,772.58

NOTE: All figures rounded to the nearest cent

SUMMARY:

What are the benefits in going to college?

What type of jobs/profession are unattainable without a college degree?

What are the financial advantages in "staying home" for college?

Make a list of the colleges that you would be interested in attending.

Institution	Tuition and fees	Books and supplies	Room and board	Transportation	Other expenses	Total student budget	Additional out-of-state/district tuition	Need analysis document required	Financial aid priority and/or closing date	
Dalton Vocational School of Health Occupations	650			(200)	(100)			FAF		
DeKalb Community College	840	280					1,710/ 360	FAF*, FFS		
DeKalb General Hospital School of Radiologic Technology	150	175	(1,200)	(520)	(800)	(2,845)				
DeVry Institute of Technology	3,500	240	(1,100)	(528)	(784)	(6,152)		FAF		
‡ Draughon's Junior College	2,260	300	(1,009)	(1,225)	(738)	(5,532)		FAF		
Emanuel County Junior College	699	360	(1,100)	(600)	(300)	(3,059)	1,293/ —	FAF		
Emmanuel College	2,235	200	1,863 (800)	300 (300)	446 (446)	5,044 (3,981)		FAF*, FFS	7/15	
Emmanuel College School of Christian Ministries	2,235	200	1,863	300 (300)	446 (446)	5,044 (3,181)		FAF, FFS	7/15	
Emory University	7,630	300	3,200 (1,100)	600 (600)	630 (630)	12,360 (10,260)		FAF		4/1
Floyd Junior College	675	255	(1,100)	(700)	(600)	(3,330)	1,293/ —	FAF	5/1	
‡ Fort Valley State College	1,101	375	1,710 (951)	215 (1,005)	600	4,001 (3,432)	1,692/ —	FAF	4/15	5/1
Gainesville Junior College	708	300					1,293/ —	FAF		
Georgia Baptist Hospital School of Nursing	2,400	400	1,800 (900)	275 (1,060)	1,000 (1,000)	5,875 (5,760)		FAF		
Georgia College	1,024	300	1,380	128 (750)	632 (632)	3,464 (2,706)	1,707/ —	FAF	4/15	
Georgia Institute of Technology	1,416	330	2,850 (850)	300 (650)	650 (650)	5,546 (3,896)	2,760/ —	FAF		2/15
Georgia Military College	1,892	350	3,462			5,704		FAF		
Georgia Southern College	1,086	300	1,860 (840)	600 (450)	600 (600)	4,446 (3,276)	1,707/ —	FAF	3/1	
Georgia Southwestern College	1,053	226	1,731 (1,000)	200 (400)	600 (600)	3,810 (3,279)	1,707/ —	FAF		
Georgia State University	1,185	270	(1,100)	(216)	(594)	(3,365)	2,700/ —	FAF	4/1	
Gordon Junior College	705	200	1,500 (1,190)	100 (748)	650 (650)	3,155 (3,493)	1,293/ —	FAF	4/15	
Gupton Jones College of Funeral Service	3,200							AFSA		
Kennesaw College	936	225		(600)	(500)	(2,261)	1,707/ —	FAF	4/15	
LaGrange College	2,805	300	1,680 (1,100)	350 (450)	500 (600)	5,635 (5,255)		FAF	8/1	
* Lanier Area Vocational-Technical School	268	400								
Macon Area Vocational-Technical School	300	200	(1,100)		(897)	(2,497)		FFS		
Macon Junior College	675	225					1,293/ —	FAF		
Marietta-Cobb Area Vocational-Technical School	309	300	(1,100)	(520)	(1,000)	(3,229)		FAF		
* Meadows College of Business	2,400	240						AFSA		
Medical Center School Of Radiologic Techology	600	700		(500)	(1,500)	(3,300)		FAF, FFS		
Medical College of Georgia	1,302	440	(900)	315 (495)	1,125 (900)	3,182 (4,037)	2,262/ —	FAF	5/1	
Mercer University	4,893	250	2,394	300 (250)	500 (500)	8,337 (5,893)		FAF	5/1	
Mercer University in Atlanta	3,600	300	(450)	(660)	(750)	(5,760)		FAF*, FFS	5/1	
Middle Georgia College	780	220	1,620 (945)	100 (300)	500 (550)	3,220 (2,795)	1,293/ —	FAF*, FFS	7/1	
Morehouse College	3,760	300	2,560	600 (200)	600 (500)	7,820 (4,760)		FAF	4/15	7/15
Morris Brown College	3,670	300	1,990 (1,100)	400 (400)	500 (500)	6,860 (5,970)		FAF*, FFS	5/15	
Moultrie Area Vocational-Technical School	350	225	(1,000)	(832)	(500)	(2,907)		FAF		
North Georgia College	1,035	350	1,575 (600)	100 (750)	675 (525)	3,735 (3,260)	1,707/ —	FAF	6/1	
North Georgia Vocational-Technical School	100	300	(780)	(600)	(960)	(2,740)	300/ —	AFSA		
Oglethorpe University	5,260	275	2,730 (1,230)	525 (450)	450 (450)	9,240 (7,665)		FAF*, FFS		
Oxford College of Emory University	5,740	300	2,740 (1,270)	675 (400)	675 (600)	10,130 (8,310)		FAF*, FFS	4/1	
Paine College	3,270	300	1,700	300 (150)	475 (475)	6,045 (4,195)		FAF	5/15	
Phillips College: Augusta	2,500							AFSA		

* *Figures are for 1983-84.* ‡ *Figures are projected for 1984-85.*

Institution	*Tuition and fees*	*Books and supplies*	*Room and board*		*Trans-portation*		*Other expenses*		*Total student budget*		*Additional out-of-state/ district tuition*	*Need analysis document required*	*Financial aid priority and/or closing date*	
Hamilton Technical College									7,100			FFS, AFSA		
Hawkeye Institute of Technology	802	400									782/—	FAF, FFS*	3/1	5/29
Indian Hills Community College	996	525	1,398	(1,125)		(1,901)	675	(675)	3,594	(5,222)	450/—	FAF, FFS		
Iowa Central Community College	784	250	1,895	(895)	60	(650)	350	(350)	3,339	(2,929)	350/—	FAF, FFS		
Iowa Lakes Community College	865	330	2,136		579	(579)	320	(320)	4,230	(2,094)	375/—	FAF, FFS*		
Iowa Methodist School of Nursing	3,945	290	980	(430)	250	(810)	1,600	(1,600)	7,065	(7,075)		FAF*, FFS		
Iowa School of Barbering and Hairstyling	2,808	390										AFSA		
Iowa State University	1,242	350	2,198	(1,336)	272		850	(850)	4,912	(3,778)	2,208/—	FAF, FFS*	3/1	
Iowa Wesleyan College	5,300	350	2,270		450	(500)	400	(400)	8,770	(6,550)		FAF*, FFS	7/1	
• **Iowa Western Community College**	897	345		(1,200)	150	(1,584)	726	(726)	2,118	(4,752)	435/—	FAF*, FFS	6/1	
Jennie Edmundson Memorial Hospital School of Nursing	1,705	600			440	(770)	1,000	(1,000)	3,745	(4,075)	268/—	FAF, FFS	6/1	
Jennie Edmundson Memorial Hospital School of Radiologic Technology	375	250	2,500						3,125					
• **Kirkwood Community College**	780	500				(720)		(630)		(2,630)	780/—	FAF*, FFS	3/1	
La James College of Hairstyling: Fort Dodge	2,900	600						(900)		(4,400)		AFSA		
• **La James College of Hairstyling: Mason City**	2,900	600												
Lincoln Technical Institute	2,925	225				(546)		(733)		(4,429)		AFSA		
Loras College	5,000	300	2,100	(1,100)	400	(300)	500	(500)	8,300	(7,200)		FAF, FFS*	3/1	4/1
Luther College	5,975	250	2,025	(1,225)	250	(250)	250	(250)	8,750	(7,950)		FAF, FFS*	3/1	6/1
Maharishi International University	5,520	340	1,900						7,760			FAF*, FFS		
Marshalltown Community College	900	205				(375)		(495)		(1,975)	900/—	FAF*, FFS	3/15	
Marshalltown Community School of Nursing	1,450	350	1,470	(625)	150	(400)	500	(500)	3,920	(3,325)		FAF, FFS*	6/1	
Marycrest College	4,730	300	2,150	(1,080)	400	(400)	500	(500)	8,080	(7,010)		FAF, FFS*	4/15	
Mercy Hospital School of Nursing	3,885	300	1,480	(700)		(400)	600	(600)	6,265	(5,885)		FAF, FFS	6/1	
Mercy/St. Luke's Hospitals School of Radiologic Technology	350	150		(900)		(300)		(500)		(2,200)		FAF, FFS		9/1
Morningside College	5,575	300	1,950		200	(400)	300	(300)	8,325	(6,575)		FAF, FFS*	6/1	
Mount Mercy College	4,530	250	2,015						6,795			FAF, FFS	3/1	
Mount St. Clare College	3,660	200	2,150	(1,100)	200	(300)	600	(500)	6,810	(5,760)		FAF*, FFS	3/1	
Muscatine Community College	914	300		(1,100)		(805)		(805)		(3,924)	400/—	FAF, FFS	7/1	
National Institute of Technology	3,300											AFSA		
North Iowa Area Community College	844	250	1,800	(1,100)		(800)	500	(500)	3,394	(3,494)	380/—	FAF, FFS	3/15	
Northeast Iowa Technical Institute	927	350				(900)		(545)		(2,722)	792/—	FAF*, FFS	3/1	
Northeast Iowa Technical Institute: South Center	950	350	2,400	(450)	220	(920)	545	(545)	4,465	(3,215)	510/—	FAF*, FFS	3/1	
• **Northwest Iowa Technical College**	852	445		(1,100)		(1,049)		(495)		(3,941)	345/—	FAF, FFS	3/1	
Northwestern College	4,752	250	1,730	(990)	350	(200)	650	(650)	7,732	(6,842)		FAF*, FFS	5/15	
Open Bible College	2,420	225	2,500	(1,250)	400	(370)	400	(350)	5,945	(4,615)		FAF, FFS*	7/1	7/15
• **Ottumwa Beauty Academy**	1,098	327												
St. Ambrose College	5,130	350	2,200	(1,100)	300	(450)	450	(300)	8,430	(7,330)		FAF, FFS*	2/15	
St. Joseph Mercy School of Nursing	3,200‡	475		(900)		(400)		(400)		(5,375)		FAF, FFS		
St. Luke's Hospital School of Nursing	5,325	225	1,675			(500)		(500)	7,225	(6,550)		FFS		
St. Luke's School of Nursing	3,459	600				(311)				(4,370)		FAF, FFS		

• *Figures are for 1983-84. ‡ Figures are projected for 1984-85.*

Institution	*Tuition and fees*	*Books and supplies*	*Room and board*	*Trans-portation*	*Other expenses*	*Total student budget*	*Additional out-of-state/ district tuition*	*Need analysis document required*	*Financial aid priority and/or closing date*
* Rutgers—The State University of New Jersey: Cook College	1,840	315	2,270		1,100 (2,600)	5,525 (4,755)	1,490/ —	FAF	3/1
* Rutgers—The State University of New Jersey: Douglass College	1.840	315	2,270		1,100 (2,600)	5,525 (4,755)	1,490/ —	FAF	3/1
‡ Rutgers—The State University of New Jersey: Livingston College	1,852	315	2,270		1,100 (2,600)	5,537 (4,767)	1,490/ —	FAF	3/1
* Rutgers—The State University of New Jersey: Mason Gross School of the Arts	1,823	315	2,270		1,100 (2,600)	5,508 (4,738)	1,490/ —	FAF	3/1
* Rutgers—The State University of New Jersey: Newark College of Arts and Sciences	1,740	315			(2,600)	(4,655)	1,490/ —	FAF	3/1
* Rutgers—The State University of New Jersey: Rutgers College	1,854	315	2,270		1,100 (2,600)	5,539 (4,769)	1,490/ —	FAF	3/1
* Rutgers—The State University of New Jersey: University College at Camden	1,500	150					1,500/ —	FAF	3/1
* Rutgers—The State University of New Jersey: University College at New Brunswick	1,500	150					1,500/ —	FAF	3/1
* Rutgers—The State University of New Jersey: University College at Newark	1,500	150					1,500/ —	FAF	3/1
St. Barnabas Medical Center Program of Nuclear Medicine Technology	2,000							FAF, FFS	7/4
* St. Francis Medical Center School of Nursing	992	200	(522)	(563)	(970)	(3,247)		AFSA	
St. Peter's College	4,397	250	(1,100)	(350)	(400)	(6,497)		FAF	3/1
* Salem Community College	805	400		(800)	(320)	(2,325)	400/ 200	FAF	
* Sawyer School of Clifton	2,965	175	(734)	(270)	(570)	(4,714)		FAF	
School of Business Machines	3,656	194	(1,100)	(300)	(600)	(5,850)		AFSA	
‡ Seton Hall University	5,500	300	3,000 (1,400)	330 (1,230)	500 (1,100)	9.630 (9,530)		FAF	4/15
Somerset County College	805	300					2,100/ 700	FAF	
Somerset County Technical Institute	862	200		(500)	(450)	(2,012)		FAF	
Stevens Institute of Technology	8,100	1,950	3,500 (2,050)	150 (825)	600 (600)	14,300 (13,525)		FAF	
* Stockton State College	1,245	275	2,650 (1,100)	388 (775)	500 (500)	5,058 (3,895)	600/ —	FAF	3/1
* Talmudical Academy of New Jersey	2,100								
Taylor Business Institute: Bridgewater	4,250	375		(640)	(900)	(6,165)		AFSA	
* Trenton State College	1,339	300	2,790 (1,750)	110 (710)	595 (595)	5,134 (4,694)	600/ —	FAF	4/1
Union County College	800	250	(1,100)	(500)	(670)	(3,320)	2,100/ 700	FAF	4/15
Upsala College	5,809	300	2,820 (1,100)	431 (256)	590 (590)	9,950 (8,055)		FAF	3/1
→ Westminster Choir College	6,304	310	2,846 (1,335)	100 (475)	625 (625)	10,165 (9,049)		FAF*, FFS	3/15
* William Paterson College of New Jersey	1,245	300	2,400 (1,150)	700 (700)	710 (1,020)	5.355 (4.415)	600/ —	FAF	5/1
Winifred B. Baldwin School of Nursing	2,200	600	1,600 (1,150)	50 (500)	300 (300)	4,750 (4,750)		FAF	6/2
New Mexico									
* Alamogordo Beauty College	2,350	150	(1,200)	(360)	(720)	(4,780)		FAF	
Artesia Christian College	1,200	200	1,600			3,000		AFSA	
College of Santa Fe	3,600	280	2,300 (1,170)	750 (450)	800 (800)	7,730 (6,300)		FAF*, FFS	

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Institution	Tuition and fees	Books and supplies	Room and board		Transportation		Other expenses		Total student budget		Additional out-of-state/district tuition	Need analysis document required	Financial aid priority and/or closing date	
College of the Southwest	1,192	250		(850)		(500)	800	(600)	2,242	(3,392)		FAF, FFS*	4/15	
* Dona Ana Beauty College	3,407	450										FAF		3/15
Eastern New Mexico University	743	300	1,720		600	(600)	750	(750)	4,113	(2,393)	1,555/—	FAF		
Eastern New Mexico University: Roswell Campus	412	300	2,754	(1,904)	200	(900)	450	(400)	4,116	(3,916)	688/—	FAF	5/1	
* Institute of American Indian Arts	150	375					630	(630)	1,155	(1,155)		FAF		
Kay Pardoll's Albuquerque Beauty College	3,042	260		(1,600)		(825)		(1,261)		(6,988)		FAF*, FFS		3/15
* Lea Regional Hospital School of Radiologic Technology	200	300		(900)		(300)		(955)		(2,655)				
Navajo Community College: Shiprock Campus	730	400	2,730	(1,920)	300	(300)			4,160	(3,350)		FAF, FFS*		
New Mexico Highlands University	527	200	1,650	(1,100)	570	(470)	656	(656)	3,603	(2,953)	1,392/—	FAF*, FFS	3/1	
New Mexico Institute of Mining and Technology	748	420	2,470	(1,100)	800	(400)	950	(950)	5,388	(3,618)	1,968/—	FAF*, FFS	3/1	
New Mexico Junior College	184	400		(750)		(640)		(800)		(2,774)	288/144	FAF*, FFS		4/1
New Mexico Military Institute	759	200	1,940		1,500		1,900		6,299		875/—	FAF*, FFS	4/1	
New Mexico State University	870	400	1,940	(1,100)	830	(800)	780	(630)	4,820	(3,800)	1,968/—	FAF*, FFS		3/1
New Mexico State University at Alamogordo	384	300									648/—	FAF*, FFS		
New Mexico State University at Carlsbad	346	304		(575)		(540)		(650)		(2,415)	648/—	FAF		
New Mexico State University at Grants	360	300									648/—	FAF*, FFS		
Northern New Mexico Community College	336	200	1,538						2,074		688/—	FAF		
St. John's College	8,250	200	2,900	(1,700)			550		11,900	(10,150)		FAF*, FFS	2/25	
San Juan College	362	330		(1,270)		(784)		(510)		(3,256)	646/—	FAF, FFS	5/1	
Santa Fe Business College	2,460	350		(1,200)		(450)		(500)		(4,960)		FAF, FFS*		
University of Albuquerque	3,960	250	2,190	(900)		(150)		(3,148)	6,400	(8,408)		FAF*, FFS	3/1	
University of New Mexico	816	210	2,347		836	(517)	994	(246)	5,203	(1,789)	1,966/—	FAF*, FFS	3/1	
University of New Mexico: Gallup	348	210				(563)		(520)		(1,641)	648/—	FAF	3/1	
Western New Mexico University	600	300	1,920	(1,100)	500	(500)	400	(400)	3,720	(2,900)	1,556/—	FAF, FFS	4/7	
New York														
Academy of Aeronautics	3,596	250										FAF		
Adelphi University	5,990	300	3,126	(1,486)	250	(1,150)	600	(500)	10,266	(9,426)		FAF		
Adirondack Community College	976	320				(550)		(600)		(2,446)	900/—	FAF*, FFS		
Advanced Training Center	3,500		1,764	(370)	330	(330)	430	(430)				FAF		
Albany Business College	3,200	250										AFSA		
Albany College of Pharmacy	3,980	300		(1,100)		(600)		(600)		(6,580)		FAF	3/1	
Albany Medical Center School of Nursing	1,990	400						(480)		(2,870)		FAF*, FFS		7/15
Albany Occupational Center	1,800	200		(1,200)		(600)		(1,500)		(5,300)				
Alfred University	7,910	300	2,860	(1,390)	250	(600)	450	(450)	11,770	(10,650)		FAF*, FFS	2/15	
American Academy of Dramatic Arts	3,600	150		(1,500)		(275)		(1,000)		(6,525)		FAF	7/1	
American Academy McAllister Institute of Funeral Service	2,680	450										AFSA		
Arnot-Ogden Memorial Hospital School of Nursing	1,490	330	1,800		390	(540)	780	(780)	4,790	(3,140)		FAF		
* Associated Beth Rivkah Schools	3,000	300										FAF		
Austin Beauty School	2,700	200		(854)		(400)		(658)		(4,812)		FAF		
Bard College	10,230	350	3,260	(1,200)	100	(500)	600	(600)	14,540	(12,880)		FAF	3/15	

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City University of New York: Brooklyn College	1,306	250			(540)	(2,096)	800/—	CUNY Aid Form	7/15	
City University of New York: City College	1,291	250	(1,100)	(488)	(540)	(3,669)	800/—	CUNY Aid Form	6/30	
City University of New York: College of Staten Island	1,303	250	(1,100)	(488)	(540)	(3,681)	800/—	CUNY Aid Form	5/25	
City University of New York: Herbert H. Lehman College	1,276	250	(1,100)	(488)	(540)	(3,654)	800/—	CUNY Aid Form	5/30	
City University of New York: Hostos Community College	1,249	250	(1,100)	(488)	(540)	(3,627)	800/—	CUNY Aid Form		
City University of New York: Hunter College	1,275	250	(1,100)	(488)	(540)	(3,653)	800/—	CUNY Aid Form		5/20
City University of New York: John Jay College of Criminal Justice	1,290	250		(488)	(540)	(2,568)	800/—	CUNY Aid Form	7/15	
* City University of New York: Kingsborough Community College	1,295	250	(1,100)	(488)	(540)	(3,673)	800/—	CUNY Aid Form	8/1	
City University of New York: La Guardia Community College	1,305	250	(1,100)	(488)	(540)	(3,683)	800/—	CUNY Aid Form	8/1	
City University of New York: Medgar Evers College	1,276	250		(488)	(540)	(2,554)	800/—	CUNY Aid Form	6/1	
City University of New York: New York City Technical College	1,272	250	(1,100)	(488)	(540)	(3,650)	800/—	CUNY Aid Form	6/15	
City University of New York: Queens College	1,375	250		(488)	(540)	(2,653)	800/—	CUNY Aid Form	6/1	
City University of New York: Queensborough Community College	1,289	250		(488)	(919)	(2,946)	800/—	CUNY Aid Form	5/1	
City University of New York: York College	1,280	250		(488)	(540)	(2,558)	800/—	CUNY Aid Form	6/1	
Clarkson University	7,890	300	3,400	400	600	12,590		FAF*, FFS		2/1
Clinton Community College	1,087	250	(1,100)	(650)	(600)	(3,687)	1,000/—	AFSA		
Colgate University	9,155	250	3,265		680	13,350		FAF		2/1
College for Human Services	5,520	300						AFSA		
College of Insurance	4,700	400	2,200	300 (250)	700 (700)	8,300 (6,050)		FAF		1/1
College of Mount St. Vincent	5,300	300	3,300 (1,450)	105 (350)	770 (650)	9,775 (8,050)		FAF	3/1	
College of New Rochelle	5,250	400	3,240 (1,100)	150 (500)	250 (250)	9,290 (7,500)		FAF		
College of New Rochelle: School of New Resources	3,300	300		(400)	(300)	(4,300)		AFSA		
College of St. Rose	4,890	300	3,000	100 (150)	600 (600)	8,890 (5,940)		FAF	3/1	
* Columbia Memorial Hospital School of Nursing	1,829	350		(500)	(1,200)	(3,879)	368/—	AFSA		
Columbia University: Columbia College	9,665	325	4,118		815 (795)	14,923 (10,785)		FAF		2/15
Columbia University: School of Engineering and Applied Science	9,665	300	4,118		645 (498)	14,728 (10,463)		FAF		1/20
Columbia University: School of General Studies	8,940	400						FAF		
‡ Columbia University: School of Nursing	9,505	525	4,165 (1,190)	280 (375)	850 (850)	15,325 (12,445)		FAF	3/15	
‡ Columbia-Greene Community College	1,270	200	(1,100)	(500)	(500)	(3,570)	1,180/—	FAF	7/1	
* Community College of the Finger Lakes	1,193	250	(1,100)	(545)	(400)	(3,488)	1,100/—	FAF	5/1	
Concordia College	4,390	300	2,545 (1,120)	350 (300)	800 (500)	8,385 (6,610)		FAF*, FFS	4/15	
Continental School of Beauty Culture	2,850	400	(900)	(600)	(900)	(5,650)		FAF		
Cooper Union	300	1,000	(2,700)	(300)	(1,000)	(5,300)		FAF		5/1

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Rabbinical College of Long Island	2,800		2,500									AFSA		
Rabbinical Seminary of America	3,000	1,000	3,000						7,000			FAF		
• Rabbinical Seminary M'Kor Chaim	2,100		1,800									AFSA		
• Raphael School of Beauty Culture	1,700	250										FAF		
Rensselaer Polytechnic Institute	9,390	350	3,210				550		13,500			FAF		1/31
• Rika Breuer Teachers Seminary	960		1,850											
Robert Fiance Hair Design Institute: Bronx	3,800	200		(976)		(432)		(1,520)		(6,928)		AFSA		
Robert Fiance Hair Design Institute: New York	3,800	221		(978)		(432)		(1,520)		(6,951)		AFSA		
Roberts Wesleyan College	4,982	225	2,338	(1,260)	200	(500)	500	(200)	8,245	(7,167)		FAF*, FFS	3/1	
Rochester Business Institute	2,945	375		(1,800)		(270)		(450)		(5,840)		AFSA		
Rochester Institute of Technology	6,400	307	3,321	(1,100)	300	(300)	505	(505)	10,833	(8,612)		FAF*, FFS	3/1	
Rochester School of Practical Nursing	1,820	100				(450)		(400)		(2,770)	120/ 120			
Rockland Community College	1,166	300				(770)		(580)		(2,816)	1,100/ —	AFSA	6/15	
Russell Sage College	6,450	250	3,132	(1,100)	200	(300)	500	(200)	10,532	(8,300)		FAF, FFS*	3/1	
St. Bonaventure University	4,990	400	2,750		400	(600)	500	(500)	9,040	(6,490)		FAF*, FFS		3/1
St. Francis College	3,900	350		(1,000)		(400)		(1,300)		(6,950)		FAF	2/15	
St. Francis Hospital School of Practical Nursing	2,450	300		(1,100)						(3,850)				
St. John Fisher College	5,410	250	2,890		150	(500)	600	(600)	9,300	(6,760)		FAF*, FFS		3/1
• St. John's Riverside Hospital Cochran School of Nursing	2,805	450		(1,000)	250	(450)	1,000	(1,500)	4,505	(6,205)		FAF		
St. John's University	4,250	300		(1,400)		(400)		(600)		(6,950)		FAF	4/1	
• St. Joseph's College	3,730	240		(1,100)		(400)		(590)		(6,060)		FAF	3/15	
St. Joseph's College: Suffolk Campus	3,730	240		(1,100)		(920)		(590)		(6,580)		FAF	3/15	
St. Lawrence University	8,560	250	2,865		200		725		12,600			FAF		2/15
St. Luke's Memorial Hospital Center School of Medical Radiography	1,900	400		(1,000)		(400)		(500)		(4,200)		AFSA		6/30
St. Mary's Hospital Medical Technology Program	1,600	300												
St. Mary's Hospital School of Nursing	1,720	300	935	(605)	80	(900)	800	(800)	3,835	(4,325)		FAF	8/1	
St. Thomas Aquinas College	3,625	220	2,400	(800)	100	(650)	550	(525)	6,895	(5,820)		FAF		3/1
St. Vincent's Hospital School of Nursing	1,400	800	2,500	(1,200)	810	(1,620)	1,478	(1,100)	6,988	(6,120)		FAF		
St. Vincent's Medical Center of Richmond	2,140	500	1,200	(1,100)	500	(500)	1,000	(1,000)	5,340	(5,240)		FAF, FFS*	6/1	
Samaritan Hospital School of Nursing	2,400				300	(500)	1,000	(1,200)				FAF		
Sarah Lawrence College	10,080	300	4,200	(1,525)			600	(600)	15,180	(12,505)		FAF		2/1
Sawyer School	3,200	90		(825)		(360)		(550)		(5,025)		AFSA		6/15
Schenectady County Community College	1,183	250		(1,100)		(200)		(500)		(3,233)	1,100/ —	FAF	5/1	
School of Visual Arts	5,670	900	3,600	(1,030)		(435)	900	(745)	11,070	(8,780)		FAF	3/9	
• Sh'or Yoshuv Rabbinical College	2,400		2,000									AFSA		
Siena College	5,115	275	3,110	(1,100)	250	(450)	450	(450)	9,200	(7,390)		FAF, FFS		2/1
Simmons School of Mortuary Science	2,700	300												
Sisters of Charity Hospital	1,085	350	1,300	(1,100)	250	(500)	400	(400)	3,385	(3,435)		FAF*, FFS		1/11
Skidmore College	8,965	300	3,650	(1,760)	300	(300)	600	(600)	13,815	(11,925)		FAF		2/1
Skinner Business School	3,620	160		(1,100)		(450)		(400)		(5,730)		FAF		

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CONSUMER MATHEMATICS

LEISURE

LESSON: 19

Aim: What is the chancy world between 0 and 1?

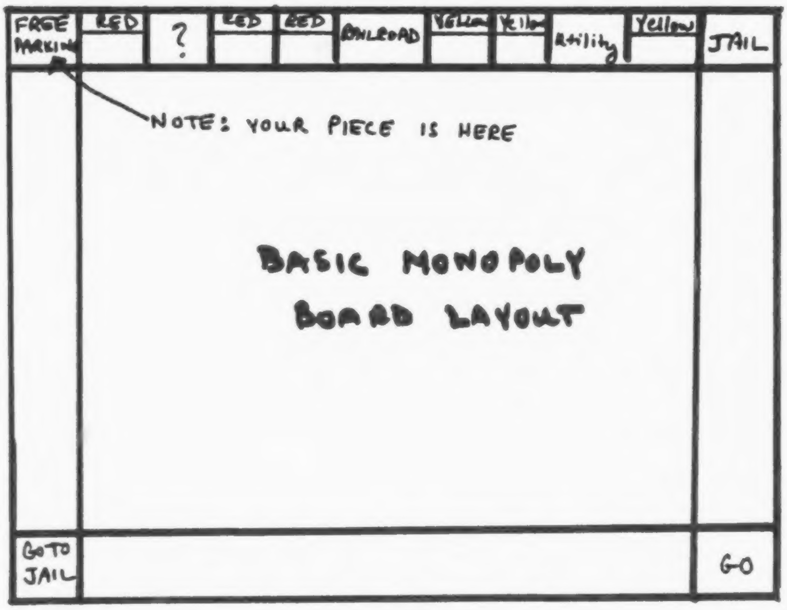
PERFORMANCE OBJECTIVES: The student will be able to ...

1) define and compute the probability of an event occurring.
2) define and compute the odds of an event occurring.

VOCABULARY: event, probability, sample space, odds, success, random, impossible, certainty, independent, die, dice, dependent

MOTIVATION:

In the game of Monopoly all moves are determined by the toss of one fair die. If you are currently on the space called "FREE PARKING," what is the probability you will wind up in "JAIL" on the next toss if you do not land on "?"?


FREE PARKING
RED
?
RED
RED
RAILROAD
Yellow
Yellow
utility
Yellow
JAIL
NOTE: YOUR PIECE IS HERE
BASIC MONOPOLY BOARD LAYOUT
GO TO JAIL
GO

DEVELOPMENT:

1. Discuss Motivation: Since the number of squares is >6, the "probability of the event: going to JAIL" is zero.

2. Ask: "What does the word random mean?"
   Elicit: Every time in the experiment (sample space) has an equal chance of being selected.

3. Ask: "What is the batting average of a hitter who has been at bat three times without a hit?"
   Elicit: from Lesson No. 17
   $$\text{Batting Average} = \frac{\text{total hits}}{\text{total official at bats}} = \frac{0}{3} = .000$$

4. Ask: "What is the batting average of a hitter who has hit safely 4 times in 4 at bats?"
   Elicit: $\frac{4}{4} = 1.000$

5. Ask: "How can we incorporate the previous two examples into 'groundrules' for the probability of an event?"
   Elicit: The lowest possible probability (b.a.) is 0; the highest probability (b.a.) is 1.000. These are also the lowest and highest probabilities that can be assigned.

6. Ask: "Can you think of a formula that we can apply in order to determine the probability of an event?"
   Elicit: P(EVENT)
   $$= \frac{\text{The Number of Ways a "Success" Can Occur}}{\text{The Number of Ways, In All, For the Event to Occur}}$$

7. Reduce the expression to a simple formula:
   $$P(e) = \frac{n(e)}{n(s)}$$

8. Do Application Number 1

9. We already know the probability of getting any outcome (i.e. a six-spot) on a single die is $\frac{1}{6}$.
   Ask: What is the probability of getting a double-six in one toss of 2 dice?
   Elicit: $\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$.

10. Ask: "Since the sum of a double-six is 12, how can we develop a method of finding the sums of the two dice?"
    Elicit: List the outcomes.

11. Do Application Number 2.

12. Ask: "How many "events" are in the table?"
    Elicit: 11 different sums 2 thru 11, inclusive leading to 36 events in all.

13. Ask: "If we refer to 36 as the sample space, how many of the outcomes show a 2 as a sum?"
    Elicit: 1 of the 36 therefore P(2) = $\frac{1}{36}$.
    Note: Stress notation to be used.

14. Do Application Number 3.

15. Ask: "If we add all the probabilities derived, what must they sum to?
    Elicit: One.

16. Ask: "Will this always be the result when we add the probabilities of all outcomes?
    Elicit: The sum of the sample space must equal one.

17. Ask: "How do odds differ from probabilities?
    Elicit: Odds are a ratio of successes to non-successes.

18. Ask: "How can we compute the odds of obtaining a sum of 2?
    Elicit: For a 2 dice a sum of two is obtained in only 1 way, therefore the odds would be 35:1.

19. Do Application Number 4.

20. Ask: "Does the local newspaper give the probabilities of the home teams winning or losing or the odds?"
    Elicit: Usually the odds and the "pointspread."

21. Ask: "What does it mean when the odds on a horse winning a race are 4:1?"
    Elicit: The horse should only win about 1 race in 5 attempts.

APPLICATIONS:

1. An urn contains 2 red balls and 2 white balls.
    a) What is the probability of drawing a red ball?
    b) What is the probability of drawing a white ball?
    c) If the first selection is a red ball and it is replaced, what is the probability of a red ball being selected again?

d) If the first selection is a red ball and it is not replaced what is the probability of a red ball being selected again?

e) How do events d) and c) differ?

2. Set up a table (or list) of all the outcomes (sums) of two dice tossed simultaneously.

3. Using the results obtained from the table you've just formed, find the probabilities associated with each sum.

4. Find the odds of getting each sum of a die versus getting a sum of 7.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) $P(E) = \frac{2}{2+3} = \frac{2}{5}$

   b) $P(E) = \frac{3}{2+3} = \frac{3}{5}$

   c) $P(E) = \frac{2}{5}$

   d) $P(E) = \frac{2}{5} \cdot \frac{1}{4} = \frac{2}{20} = \frac{1}{10}$

   e) the first c) is independent; the second d) is dependent

2.

		Results of 1st die					
		1	2	3	4	5	6
	1	2	3	4	5	6	7
Results of 2nd die	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

Sums in the center
of the table

3. $P(2) = \frac{1}{36}$

$P(3) = \frac{2}{36}$

$P(4) = \frac{3}{36}$

$P(5) = \frac{4}{36}$

$P(6) = \frac{5}{36}$

$P(7) = \frac{6}{36}$

$P(8) = \frac{5}{36}$

$P(9) = \frac{4}{36}$

$P(10) = \frac{3}{36}$

$P(11) = \frac{2}{36}$

$P(12) = \frac{1}{36}$

4. Sum of 2 vs. sum of 7 = $\frac{1}{36} : \frac{6}{36}$ 6 to 1 against a two

Sum of 3 vs. sum of 7 = $\frac{2}{36} : \frac{6}{36}$ 6 to 2 against a three

Sum of 4 vs. sum of 7 = $\frac{3}{36} : \frac{6}{36}$ 6 to 3 against a four

Sum of 5 vs. sum of 7 = $\frac{4}{36} : \frac{6}{36}$ 6 to 4 against a five

Sum of 6 vs. sum of 7 = $\frac{5}{36} : \frac{6}{36}$ 6 to 5 against a six

Sum of 8 vs. sum of 7 = $\frac{5}{36} : \frac{6}{36}$ 6 to 5 against a eight

Sum of 9 vs. sum of 7 = $\frac{4}{36} : \frac{6}{36}$ 6 to 4 against a nine

Sum of 10 vs. sum of 7 = $\frac{3}{36} : \frac{6}{36}$ 6 to 3 against a ten

Sum of 11 vs. sum of 7 = $\frac{2}{36} : \frac{6}{36}$ 6 to 2 against a eleven

Sum of 12 vs. sum of 7 = $\frac{1}{36} : \frac{6}{36}$ 6 to 1 against a twelve

SUMMARY:

Estimate the probabilities of the following events occurring
Give explicit reasons for your estimates.
P(A baseball being hit in the air and not coming down)?
P(Rain tomorrow)?
P($15\frac{1}{2}$" of snow tomorrow)?
P(Billy Martin will be the Manager of the Yankees)?
P(George Steinbrenner will fire him)?
P(Gov. Cuomo will be elected Governor)?
P(Lou Carnesecca will be elected President)?

CONSUMER MATHEMATICS

LEISURE

LESSON: 20

Aim: What is the difference between improbable and impossible?

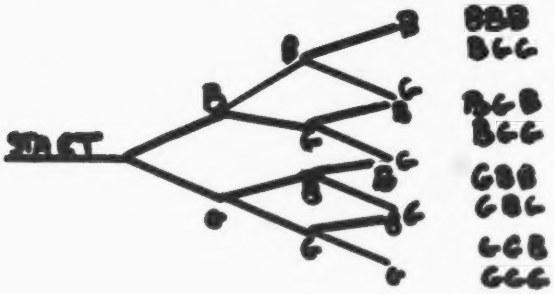
PERFORMANCE OBJECTIVES: The student will be able to...

1. Interpret probabilities to distiinguish between events which will definitely occur, are very likely to occur, and will definitelly not occur.
2. Use the principle of multiplication to determine the number of possible ways an event can occur.

VOCABULARY: successive, equiprobable, uniform probability, tree diagram, simultaneously, infers, assigned, certain, roulette wheel

MOTIVATION:

In Lesson number 19, we learned that if 1 fair die had a probability of $\frac{1}{6}$, then two successive tosses would have a $\frac{1}{6} \times \frac{1}{6}$ probability for each outcome.
How would you "diagram" the births of 3 children?



DEVELOPMENT:

1. Ask: "What is the probability of a male on the 1st birth? 2nd birth? 3rd birth?
   Elicit: The probabilty of a male (female) being born in any birth is $\frac{1}{2}$.
2. Define these events as "equiprobable" or as having uniform probabilites.
3. Ask: "Besides equiprobable, what phrase, or term, would we use to assign probabilites to the outcomes of a coin?"
   Elicit: "fair" coin
4. Ask: Given the "tree diagram" developed, how can we find the probabilites of the following events:
   - a) exactly 1 boy elicit: $\frac{3}{8}$
   - b) exactly 2 boys elicit: $\frac{3}{8}$
   - c) exactly 1 girl elicit: $\frac{3}{8}$
   - d) exactly 2 girls elicit: $\frac{3}{8}$
5. Ask: how can we account for the fact that the probabilities just derived add up to more than one?
   Elicit: events a) and d) are the same event
   events b) and c) are the same event
6. Do Application number 1
7. Ask: In how many of the events do we find "exactly" 1 quarter showing heads. Elicit: 4
8. Ask:"What is the probability a quarter will show heads".
   Elicit: $\frac{4}{8}$
   Note: Stress number of successes versus probability of success
9. Do Application number 2.
10. Ask: "What is the probability that the 3 coins will sum to 40 cents?" Elicit: Zero.
11. Ask: Why is this event assigned a probability of zero?
    Elicit: The event can not possibly occur (= impossible)

12. Do Application no. 3.
13. Do Application no. 4
14. Do Application no. 5

APPLICATIONS:

1. A nickel, dime and quarter are tossed simultaneously draw a tree diagram describing the outcomes.

2. If the only way a youngster can total up the coins is to have their tails face up, find the "number of possible sums" Remember: A head showing infers "No Value"

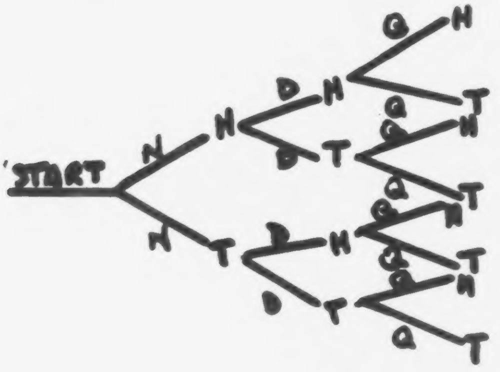
3. Determine the probabilities of the following events:
    a) P (less than .05 cents)
    b) P (less than or equal to .05 cents)
    c) P(greater than or equal to .20 cents)
    d) P (equal to .22 cents)
    e) P (greater than .25 cents)

4. For each event discussed above describe whether you feel the event is certain (definitely), very likely, unlikely definitely not occur (impossible)

5. Find the probability of each event occuring:
    a) What is the P (a goat mooing)?
    b) What is the P (a plane landing)?
    c) What is the P (the Knicks winning a football game)?
    d) What is the P (11 daughters in a row)?
    e) What is the P (4 sons in a row)?

SOLUTIONS TO APPLICATIONS PROBLEMS:

1.



OUTCOMES		
NICKEL	DIME	QUARTER
H	H	H
H	H	T
H	T	H
H	T	T
T	H	H
T	H	T
T	T	H
T	T	H
T	T	T

2. OUTCOMES

COINS→NICKEL	DIME	QUARTER	"VALUE"
H	H	H	0
H	H	T	.25
H	T	H	.10
H	T	T	.35
T	H	H	.05
T	H	T	.30
T	T	H	.15
T	T	T	.40

3. a) $\frac{1}{8}$ Note: Out come "0"/ 8 Possibilites

b) $\frac{2}{8}$

c) $\frac{4}{8}$

d) 0

e) $\frac{3}{8}$

4. a) unlikely
b) more likely
c) possible (very likely)
d) impossible
e) likely

5. a) zero
   b) one
   c) zero
   d) $(\frac{1}{2})^{11}$
   e) $(\frac{1}{2})^{4}$

SUMMARY:

What is the probability of a red occurrence or a spin of a roulette wheel?

If that roulette wheel has come out red consecutively 12 times in succession, is it more likely to turn out black the 13th time? (Discuss the " Gambler's theory of maturity")

CONSUMER MATHEMATICS
MATHEMATICS IN THE HOME
LESSON: 1

AIM: What are metric units of capacity?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Define milliliter in terms of liter.
2. Rename metric units of measure.
3. Choose a suitable unit of measure of capacity for given items.
4. Estimate, in metric units, the capacity of given items.
5. Convert from metric to English units and English to metric, using a calculator.

VOCABULARY: liter, milliliter

MOTIVATION:

Ask the class: "About how much blood has an average male adult?"

DEVELOPMENT:

1. Have the class consider various responses. Indicate that the correct response is about 5 liters. Define a liter as the basic meter unit of capacity. Remind the class that capacity is the amount a container can hold. Emphasize that a liter is slightly more than one quart ($1\ell \doteq 1.06$ qt).
2. Ask: What problems arise if we measure the capacity of a teaspoon in liters. Elicit that a teaspoon contains much less than 1 liter. Define 1 milliliter to equal .001 liter ($1\ m\ell = \frac{1}{1000}\ell$). Mention as a point of reference, that 1 teaspoon is approximately 5 milliliters. Elicit that $\frac{1}{2}$ liter = 500 $m\ell$, $\frac{1}{4}$ liter = 250 $m\ell$.
3. Ask: If $1\ m\ell = \frac{1}{1000}\ell = .001\ell$, then how many milliliters are equal to 1ℓ (1000)? Elicit that $2\ell = 2000\ m\ell$.

Elicit that to convert liter to milliliters we multiply by 1000 and to convert milliliters to liters we divide by 1000.

4. Do Applications A1-3, B1-3.

5. Ask: If 1 liter is approximately 1.06 quarts, how many quarts are contained in 2 liters? (2.12 quarts.) Ask: How can we determine the number of quarts in a given number of liters? (Multiply by 1.06.) Ask: How many liters are contained in 3.18 quarts? Elicit that the number of quarts may be divided by 1.06 to find the number of liters. Have the class find the number of liters in a gallon (4 qt = $\frac{4}{1.06}\ell = 3.77\ell$).

APPLICATIONS:

A. Rename each as liters.

1. 750 mℓ 2. 125 mℓ 3. 300 mℓ
4. 425 mℓ 5. 1125 mℓ 6. 2500 mℓ
7. 8200 mℓ 8. 789 mℓ 9. 10000 mℓ

B. Rename each as milliliters.

1. 3 ℓ 2. 4 ℓ 3. .321 ℓ
4. 42 ℓ 5. 6.21 ℓ 6. 1.01 ℓ
7. 204 ℓ 8. 9.07 ℓ 9. .054 ℓ

C. Determine which would be a more appropriate measure of capacity.

1. Fishtank 18 mℓ or 18 ℓ
2. Bottle of cola 2 mℓ or 2 ℓ
3. Glass of milk 250 mℓ or 250 ℓ
4. Test tube 75 mℓ or 75 ℓ

D. An automobile's power is often measured by its engine capacity. Find the capacity of each cylinder in milliliters.

1. 1.4 liters , 4 cylinders
2. 2.4 liters , 6 cylinders
3. 7.2 liters , 8 cylinders

E. Calculate the missing capacity. Use 1   = 1.06 qt.

1. 2.5   = ? qt   2. 3.75   = ? qt

3. 40 qt = ?ℓ = ? mℓ   4. 4.82 qt = ?ℓ = ? mℓ

SOLUTIONS TO APPLICATION PROBLEMS:

A. Divide each by 1000

1) 0.75 ℓ   2) 0.125 ℓ   3) 3.0 ℓ   4) 0.425 ℓ

5) 1.125 ℓ   6) 2.5 ℓ   7) 8.2 ℓ   8) 0.789 ℓ

9) 10 ℓ

B. Multiply each by 1000

1) 3000 mℓ   2) 4000 mℓ   3) 321 mℓ   4) 42000 mℓ

5) 6210 mℓ   6) 1010 mℓ   7) 20400 mℓ   8) 9070 mℓ

9) 54 mℓ

C. 1) 18ℓ   2) 2ℓ   3) 250 mℓ   4) 75 mℓ

D. 1) 350 mℓ   2) $416.\overline{6}$ mℓ   3) 900 mℓ

E. 1) 2.65 qt   2) 3.975 qt

3) 37.7358ℓ = 37735.8 mℓ

4) 4.54717ℓ = 4547.17 mℓ

To find qt, Divide ℓ by 1.06

To find ℓ, Multiply qt by 1.06

Multiply ℓ by 1000 to find mℓ.

SUMMARY:

Ask: What are two commonly used metric units of capacity? What is the relationship between them? How does each compare to 1 quart?

(Milliliter, Liter)

(1000 m = 1ℓ)

(1 ℓ is approximately 1 qt, so 1 mℓ ≐ .001 qt)

CONSUMER MATHEMATICS
MATHEMATICS IN THE HOME
LESSON: 2

AIM: How do we solve verbal problems in planning meals?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Adjust recipes to determine amounts of ingredients needed.

MOTIVATION:

The Stevensons, a family of four, consume eight quarts of orange juice per week. If four cousins spend the week with them, how much orange juice should the family expect to consume?

DEVELOPMENT:

1. Elicit that since there will be twice as many people, the Stevensons might expect to use twice as many juice, or sixteen quarts. Ask: How can this be written as a proportion? ($\frac{8}{4} = \frac{16}{8}$)
   Elicit that this can be generalized as:
   $$\frac{\text{PEOPLE TO BE SERVED}}{\text{PEOPLE USUALLY SERVED}} = \frac{\text{NEW AMOUNT OF FOOD}}{\text{USUAL AMOUNT OF FOOD}}$$, and that
   $$\frac{\text{PEOPLE TO BE SERVED}}{\text{PEOPLE USUALLY SERVED}} \times \text{USUAL AMOUNT OF FOOD} = \text{NEW AMOUNT OF FOOD.}$$

2. Ask: How can Mrs. Stevenson's dessert recipe be adjusted to allow for their guests? Elicit that the formula above can be used for each ingredient in the recipe.
   Home-made ice cream

(serves 6)	(Recipe for 8)
$\frac{3}{4}$ cup sugar	$\frac{8}{6} \times \frac{3}{4} = \frac{24}{24} = 1$ cup
$\frac{1}{4}$ tsp salt	$\frac{8}{6} \times \frac{1}{4} = \frac{8}{24} = \frac{1}{3}$ tsp
2 cups milk	$\frac{8}{6} \times \frac{2}{1} = \frac{16}{6} = \frac{8}{3} = 2\frac{2}{3}$ cups
2 eggs	$\frac{8}{6} \times \frac{2}{1} = \frac{16}{6} = \frac{8}{3} = 2\frac{2}{3}$ eggs (make it 3)
2 cups whipped cream	$\frac{8}{6} \times \frac{2}{1} = \frac{16}{6} = \frac{8}{3} = 2\frac{2}{3}$ cups
$\frac{3}{4}$ tbsp vanilla	$\frac{8}{6} \times \frac{3}{4} = \frac{24}{24} = 1$ tbsp

APPLICATIONS:

A. Adjust each recipe as needed.

1. Royal Potatoes
   6 large potatoes
   2 cups boiled cabbage
   $\frac{1}{3}$ cup melted butter
   $\frac{1}{2}$ cup diced onions
   serves 6, to serve 18

2. Dessert Topping
   1 egg
   $\frac{1}{3}$ cup butter
   $\frac{1}{3}$ cup water
   $\frac{3}{4}$ cup sugar
   $\frac{1}{2}$ cup corn syrup
   serves 5, to serve 20

3. Loaf Bread
   3 cups flour
   $\frac{3}{4}$ cup sugar
   $3\frac{1}{2}$ tsp baking powder
   1 tsp salt
   1 egg
   $1\frac{1}{2}$ tbsp butter
   $1\frac{3}{4}$ cups milk
   $\frac{3}{4}$ cup chopped nuts
   2 tbsp corn oil
   serves 8, to serve 32

4. Kaiser Rolls
   1 package dry yeast
   $1\frac{1}{3}$ cups water
   $1\frac{1}{4}$ tsp salt
   $3\frac{3}{4}$ cups flour
   2 beaten eggs
   serves 12, to serve 6

5. Spicy Peas
$1\frac{1}{2}$ cups chopped onions
$5\frac{1}{4}$ tbsp olive oil
1 cup chili sauce
$1\frac{1}{2}$ tsp salt
8 cups snow peas
serves 24, to serve 16

SOLUTIONS TO APPLICATION PROBLEMS:

A. 1. Multiply each amount by $\frac{18}{6} = 3$
18 potatoes, 6 cups cabbage, 1 cup butter,
$1\frac{1}{2}$ cup onions

2. Multiply by $\frac{20}{5} = 4$
4 eggs, $1\frac{1}{3}$ cup butter, $1\frac{1}{3}$ cup water, 3 cups sugar,
2 cups corn syrup

3. Multiply by $\frac{32}{8} = 4$
12 cups flour, 3 cups sugar, 14 tsp baking powder,
4 tsp salt, 4 eggs, 6 tsp butter, 7 cups milk,
3 cups chopped nuts, 8 tbsp corn oil

4. Multiply by $\frac{6}{12} = \frac{1}{2}$
$\frac{1}{2}$ pkge yeast, $\frac{2}{3}$ cup water, $\frac{5}{8}$ tsp salt, $1\frac{7}{8}$ cup flour
1 egg

5. Multiply by $\frac{16}{24} = \frac{2}{3}$
1 cup onions, $3\frac{1}{2}$ tbsp olive oil, $\frac{2}{3}$ cup chili sauce,
1 tsp salt, $5\frac{1}{3}$ cup peas

SUMMARY:

What information is needed to adjust recipes to determine the amount of new ingredients?

CONSUMER MATHEMATICS

MATHEMATICS IN THE HOME

LESSON: 3

AIM: How do we analyze calorie consumption?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Define a calorie.
2. Compute the total calorie intake of a meal.
3. Determine net calorie gain based on diet and exercise.

VOCABULARY: calorie

MOTIVATION:

Ask: What is a calorie?

DEVELOPMENT:

1. Elicit that a calorie is a measure of energy. A food calorie is the amount of energy required to raise the temperature of 1 liter of water 1 degree celsius. Ask: Why do people count calories? Elicit that if more calories are taken in than used up, a person will gain weight.

2. Prepare two charts showing the calorie content of certain foods, and the rate at which calories are used.

a)

Food	Calories	Food	Calories
Apple	76	Milk (1 cup)	150
Banana	88	Butter (1 pat)	100
Orange	70	Milk, Skim (1 cup)	85
Orange Juice (1 cup)	120	Hot Dog	170
Bread, White (slice)	63	Hamburger (3 oz)	316
Pancake, with syrup	150	Chicken (drumstick)	90
Rolls (each)	118	Steak (3 oz)	300
Fried Egg	85	Green Beans (cup)	35
Milkshake	355	Tomato (whole)	26
Potato Chips (snack)	230	Potato, French Fried	160

Cookie (choc. chip)	52	Yogurt, Fruit (cup)	180
Potato (baked)	97	Tuna (3 oz)	247
Cola (1 cup)	150	Carrot (whole)	32

b) Activity — Calories required per hour (may vary, depending on age, weight and sex).

Activity	Calories required per hour (may vary, depending on age, weight and sex).
Bicycling	270
Dancing, fast	460
Jogging	540
Sitting, light activity	100
Skating (fast)	690
Sleeping	66
Swimming	660
Tennis	426
Walking (average)	180

3. Ask: How can you determine if your diet and activities will result in gaining or losing weight? Elicit that your net caloric gain can be found by adding all your calories taken in and subtracting the calories used by daily activities. Ask, "What will be the result of constant positive net gain?" (Weight Gain) "What will be the result of constant negative net gain? (Weight Loss)

APPLICATIONS:

A. Find the calorie intake of each meal.

1. Breakfast
   - Orange Juice - 1 cup
   - Pancakes - 3
   - Milk (whole) - 1 cup

2. Breakfast
   - Banana
   - Bread and Butter (2 slices)
   - Fried Eggs - 2
   - Skim Milk (1 cup)

3. Lunch
   - Hot Dogs - 2 (with rolls)
   - Potato Chips
   - Carrot
   - Cola - 1 cup

4. Lunch
   - Hamburger (with roll)
   - French Fried Potato
   - Cookie
   - Apple
   - Milk (whole) 1 cup

5. Dinner
   Steak - 6 oz
   Potato (baked)
   Tomato (half)
   Green Beans - 1 cup
   Bread and Butter - 1 slice
   Milk (whole) - 1 cup

6. Dinner
   Orange Juice - 1 cup
   Carrots (whole) - 2
   Tuna - 3 oz
   Yogurt, Fruit - 1 cup
   Roll (no butter)
   Skim Milk - 1 cup
   Tomato, whole

B. Determine the number of calories used by the following daily activities:

1.

Sleeping	8 hrs
Light Activity	12 hrs
Walking	2 hrs
Skating	1 hr
Bicycling	1 hr

2.

Sleeping	$7\frac{1}{2}$ hrs
Light Activity	12 hrs
Jogging	$1\frac{1}{2}$ hrs
Swimming	$1\frac{1}{2}$ hrs
Walking	$1\frac{1}{2}$ hrs

3.

Light Activity	10.75 hrs
Sleeping	7.75 hrs
Tennis	2 hrs
Swimming	1.75 hrs
Dancing	1.75 hrs

4.

Sleeping	$8\frac{1}{4}$ hrs
Swimming	$2\frac{1}{4}$ hrs
Walking	$1\frac{3}{4}$ hrs
Skating	$1\frac{3}{4}$ hrs
Light Activity	10 hrs

C. Determine if the following combinations of meals and activities results in a positive or negative net calorie gain.

1. Breakfast: Meal 1 (Part A above)
   Lunch: Meal 3
   Dinner: Meal 6
   Activities: (Part B, 2)

2. Breakfast: Meal 2
   Lunch: Meal 4
   Dinner: Meal 5
   Activities: (Part B, 3)

SOLUTIONS TO APPLICATION PROBLEMS:

A. 1. $120 + 3(150) + 150 = 720$ cal

2. $88 + 2(163) + 2(85) + 85 = 669$ cal

3. $2(170+118) + 230 + 32 + 150 = 988$ cal

4. $(316+118) + 160 + 52 + 76 + 150 = 872$ cal

5. $2(300) + 97 + \frac{1}{2}(26) + 35 + (63+100) + 150 = 1058$ cal

6. $120 + 2(32) + 247 + 180 + 118 + 85 + 26 = 840$ cal

B. 1. $8(66) + 12(100) + 2(180) + 690 + 270 = 3048$ cal

2. $7\frac{1}{2}(66) + 12(100) + 1\frac{1}{2}(540) + 1\frac{1}{2}(660) + 1\frac{1}{2}(180)$
$= 3765$ cal

3. $10.75(100) + 7.75(66) + 2(426) + 1.75(660) +$
$1.75(460) = 4398.5$

4. $8\frac{1}{4}(66) + 2\frac{1}{4}(660) + 1\frac{3}{4}(180) + 1\frac{3}{4}(690) + 10(100)$
$= 4552$ cal

C. 1. $(720+988+840)-(3765) = -1217$
Ask, "What about snacks?"

2. $(669+872+1058)-(4398.5) = -1799.5$

SUMMARY:

Ask: "How can you tell if a combination of diet and activity will result in a weight loss?" (If total caloric intake - calories used in activity is negative.)

CONSUMER MATHEMATICS

MATHEMATICS IN THE HOME

LESSON: 4

AIM: What are metric units of length?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Define millimeter, centimeter and kilometer in terms of meter.
2. Rename metric units of length.
3. Choose a suitable unit of length for given items.
4. Estimate, in metric units, the length of given items.
5. Convert from English to metric, and metric to English, using a calculator.

VOCABULARY: meter, millimeter, centimeter, kilometer

MOTIVATION:

Ask the class: "How many inches are in one mile?"

DEVELOPMENT:

1. Elicit that 12 inches equal 1 foot and 5280 feet equal 1 mile. Therefore 12 x 5280 = 63360 inches in 1 mile. Mention that some men considered these values inconvenient to use in measuring length and so devised the metric units of length. Ask: "What is the basic unit of length in the metric system?" (The meter.) Tell the class that the meter was originally conceived of as one ten-millionth of the distance from the north pole to the equator.
2. Say "Since this distance, measured in miles, is about 6213 miles, we have 10000000 meters = 6213 miles. This makes each mile over 1000 meters (1609 meters)." Define 1 kilometer (km) to equal 1000 meters (m). Now 1 mile = 1.609 km. Ask: "What unit of capacity did we define as 1/1000 of a liter?" (Milliliter.) "What should we call

1/1000 of a meter?" (Millimeter, mm) Elicit that 1/100 of a meter is a centimeter (cm). Summarize these relationships with a chart:

1 meter = 1000 millimeters , 1 mm = .001 m
= 100 centimeters , 1 cm = .01 m

1 kilometer = 1000 meters

1.609 kilometers = 1 mile , 1 km = .621 mile

1 meter = 39.4 inches , (A little more than 1 yard or 3 ft.)

1 centimeter = .394 inches , (About 4/10 inch.)

.254 centimeters = 1 inch

Ask: "What would be a good measure for

a) Thickness of a dime (about 1 mm).

b) The width of your little finger (about 1 cm).

c) The length of a golf club (about 1 m).

Elicit that we could use the chart to change from one unit to another by multiplying. Ask, "Rename 4 meters as a) mm b) cm." (4m = 4000 mm = 400 cm)

APPLICATIONS:

A. Rename each as meters.

1. 1 km   2. 3 km   3. 20 km
4. .5 km   5. 2.1 km   6. .34 km
7. 100 cm   8. 400 cm   9. 280 cm
10. 625 cm   11. 50 cm   12. 8 cm
13. 1000 mm   14. 2800 mm   15. 800 mm
16. 534 mm   17. 86 mm   18. 3 mm

B. Rename each as kilometers.

1. 1000 m   2. 3800 m   3. 750 m
4. 594 m   5. 71 m   6. 8 m

C. Rename each as centimeters and as millimeters.

1. 2 m   2. 6 m   3. 7.6 m
4. .85 m   5. .32 m   6. .04 m

D. Choose the appropriate measure for each example.

1. Height of a woman - 160 mm, 160 cm, 160 m, 160 km
2. Length of a finger - 6 mm, 6 cm, 6 m, 6 km
3. Distance from New York City to Boston - 350 mm, 350 cm, 350 m, 350 km
4. Length of a paper clip - 33 mm, 33 cm, 33 m, 33 km

E. Choose the appropriate unit of measure for each.

1. The diameter of a wire.
2. The distance from Staten Island to the Bronx.
3. The width of a swimming pool.
4. The length of a pen.

F. Change the given measure as indicated (you may use a calculator).

1. 4 miles to km
2. 3.7 miles to km
3. 26 km to miles
4. 14.6 km to miles
5. 2.8 m to inches
6. 3.21 m to inches
7. 8.22 cm to inches
8. 16.3 cm to inches
9. $7\frac{1}{2}$ inches to cm
10. $3\frac{3}{4}$ inches to cm

SOLUTIONS TO APPLICATION PROBLEMS:

A. (1-6, multiply km by 1000)

1. 1000 m 2. 3000 m 3. 20000 m
4. 500 m 5. 2100 m 6. 340 m

(7-12, divide cm by 100)

7. 1 m 8. 4 m 9. 2.8 m
10. 6.25 m 11. .5 m 12. .08 m

B. Divide m by 1000 to find km.

1. 1 km 2. 3.8 km 3. .75 km
4. .594 km 5. .071 km 6. .008 km

C. Multiply m by 100 to find cm, by 1000 to find mm.
1. 200 cm, 2000 mm 2. 600 cm, 6000 mm 3. 760 cm, 7600 mm
4. 85 cm, 850 mm 5. 32 cm, 320 mm 6. 4 cm, 40 mm

D. 1. 160 cm 2. 6 cm 3. 350 km
4. 33 mm

E. 1. mm 2. km 3. m
4. cm

F. 1. 4(1.609) = 6.436 km
2. 3.7(1.609) = 5.9533 km
3. 26(.621) = 16.146 miles
4. 14.6(.621) = 9.0666 miles
5. 2.8(39.4) = 110.32 inches
6. 3.21(39.4) = 126.474 inches
7. 8.22(.394) = 3.23868 inches
8. 16.3(.394) = 6.4222 inches
9. 7.5(.254) = 1.905 cm
10. 3.75(.254) = .9525 cm

SUMMARY:

Ask, "What are the primary metric units of length? Define each in terms of meters."

(meters, kilometers, centimeter, millimeter)

1 km = 1000 m
1 cm = .01 m
1 mm = .001 m

CONSUMER MATHEMATICS

MATHEMATICS IN THE HOME

LESSON: 5

AIM: How do we use scale drawings

PERFORMANCE OBJECTIVES: The student will be able to...

1. Define scale drawing, representative ratio.
2. Compute scale dimensions of real objects.
3. Compute real lengths given a scale drawing.
4. Make a scale drawing of given figures using graph paper.

VOCABULARY: Scale drawing, Representative ratio

MOTIVATION:

Bring a model railroad car or model automobile to class. Ask "What makes this model look so realistic?"

Elicit that the model is the same shape as the actual item. Ask "What kind of drawing is the model based on?" Explain that models are based on scale drawings.

DEVELOPMENT:

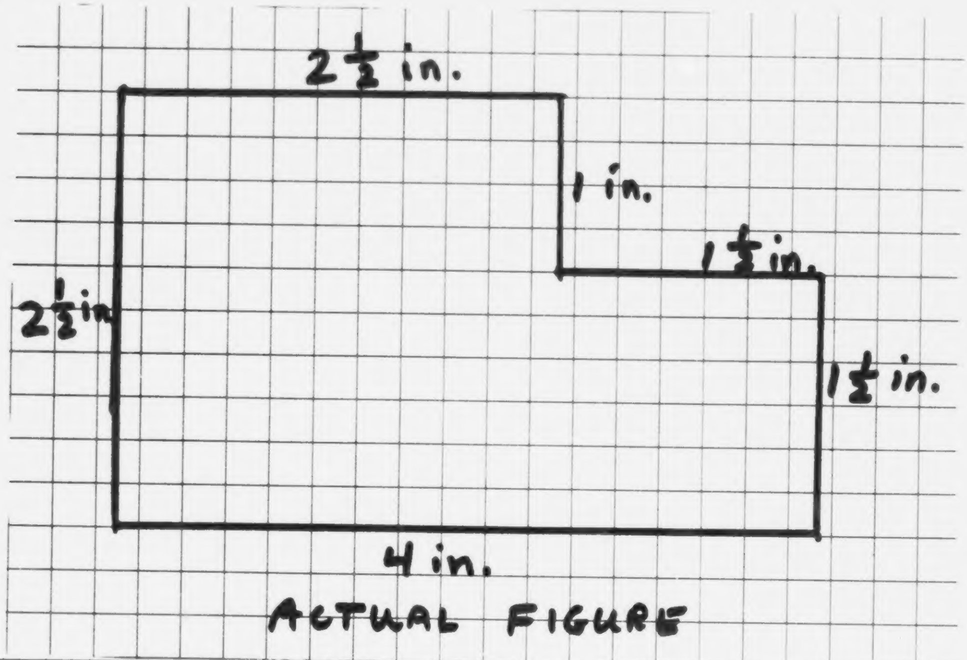
1. Consider an automobile, 180 inches long and 60 inches high. Ask: "What rule might we use to find the height of the scale drawing if we want the length to be 9 inches?" Elicit that in a scale drawing, the dimensions of corresponding parts are in proporation. We can say:

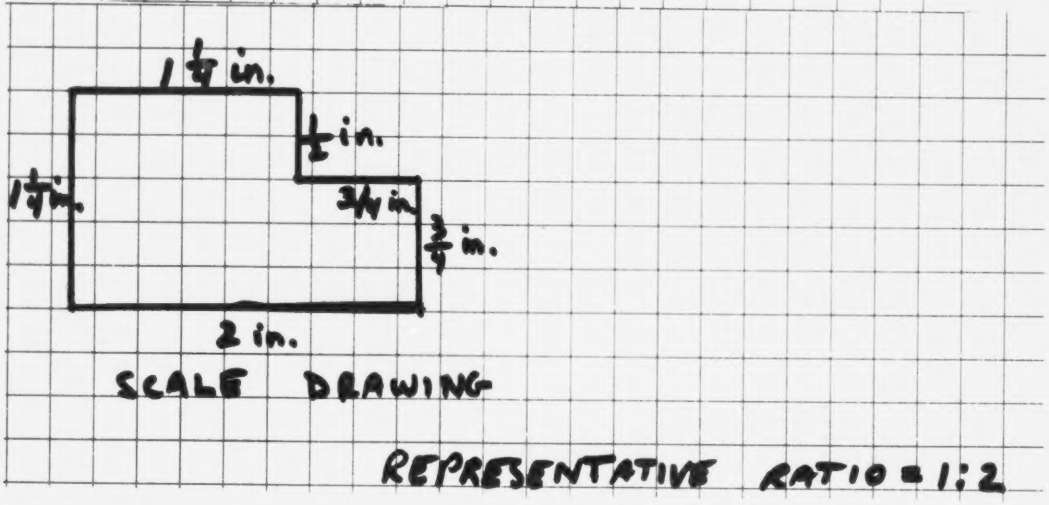
$$\frac{\text{Drawing Length}}{\text{Actual Length}} = \frac{\text{Drawing Height}}{\text{Actual Height}}$$

In our example, $\frac{9}{180} = \frac{\text{Drawing Height}}{60}$. Elicit that drawing height = 3 inches in this example. Explain that the ratio of (Drawing Length) : (Actual Length) is called the representative ratio. Ask, "What is the representative ratio here?" The answer is 9:180 or 1:20.

2. Ask, "How long would the drawing of a car door (Actual length 3 feet) be if the representative ratio is 1:20?" Answer: Change 3 feet to 36 inches and use $\frac{\text{Drawing length}}{\text{Actual length}} = \frac{1}{20}$.
Then, Drawing length = $\frac{36}{20} = 1\frac{3}{4}$ inches.

3. Ask, "How could we make a scale drawing, using graph paper, of the polygon with given dimensions (see diagram below) and a representative ratio of 1:2?" Elicit that each dimension in the scale drawing will be $\frac{1}{2}$ the actual dimension.

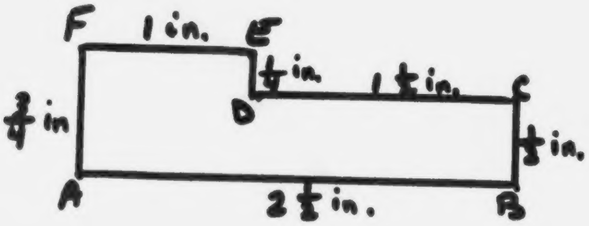

2½ in.
1 in.
1½ in.
2½ in.
1½ in.
4 in.
ACTUAL FIGURE


1¼ in.
½ in.
1¼ in.
3/4 in
¾ in.
2 in.
SCALE DRAWING
REPRESENTATIVE RATIO = 1:2

4. Sometimes a scale is given comparing dimensions with different units of measure. For example, scale: 1 inch to 2 feet. Ask "How could we find the representative ratio?" Elicit that 2 feet = 24 inches, so the ratio is 1:24.

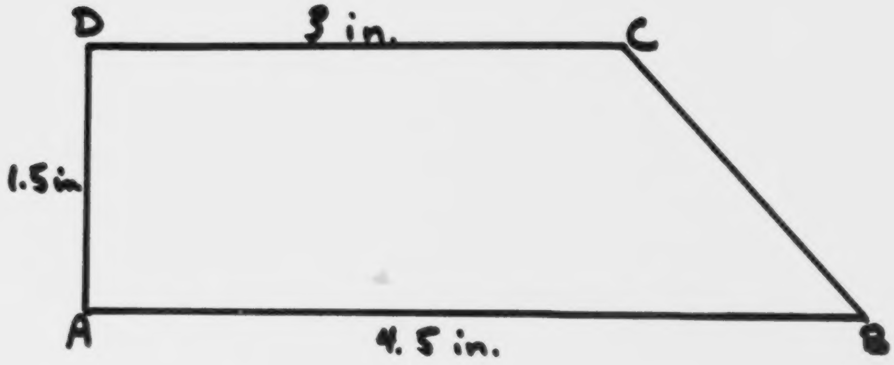
APPLICATIONS:

1. Express the representative ratio for each:
   a. Actual size = 30 inches, drawing size = 10 inches
   b. Drawing size = $4\frac{1}{2}$ inches, actual size = 9 feet
2. The length of a truck is 35 feet. How long will be a scale drawing be if:
   a. The representative ratio is 1:42
   b. The scale is 1 inch = 5 feet
3. The arrangement of furniture in an apartment is being planned using scale drawing. Using a representative ratio of 1:36, find the drawing dimensions of:
   a. A 72 inch long sofa
   b. A table 48 inches by 36 inches
   c. A 9 foot wall
4. Repeat problem (3) using a scale of 1 inch to 4 feet.
5. Given the scale drawing below, find the actual dimensions using a scale of 1 inch to 2 feet.



(Dimensions shown are drawing dimensions, not "actual" dimensions)

6. Make a scale drawing, on graph paper, of figure ABCD, using a representative ratio of 1:3.



SOLUTIONS TO APPLICATION PROBLEMS:

1. Representative Ratio = $\frac{\text{Drawing Length}}{\text{Actual Length}} = \frac{\text{Drawing Height}}{\text{Actual Height}}$

   a. Ratio = $\frac{10}{30} = \frac{1}{3}$

   b. Ratio = $4\frac{1}{2}$ inches/9 feet = $\frac{4.5 \text{ in.}}{108 \text{ in.}} = \frac{1}{24}$

2. a. $\frac{\text{Drawing}}{35} = \frac{1}{42}$, Drawing = $\frac{35}{42} = \frac{5}{6}$ ft.

   b. $\frac{\text{Drawing}}{35 \text{ ft}} = \frac{1 \text{ in}}{5 \text{ ft}}$, Drawing = $\frac{35}{5}$ = 7 in.

3. a. $\frac{\text{Drawing}}{72} = \frac{1}{36}$, Drawing = 2 in.

   b. for 48 in., $\frac{\text{Drawing}}{48} = \frac{1}{36}$, Drawing = $\frac{48}{36} = 1\frac{1}{3}$ in.

   for 36 in., Drawing = 1 in.

   c. $\frac{\text{Drawing}}{9\text{ft}} = \frac{1}{36}$, Drawing = $\frac{9}{36}$ ft.

   = $\frac{1}{4}$ ft.

   = 3 in.

4. Scale: 1 inch = 4 ft

a. 4 ft. = 48 in.; $\frac{\text{Drawing}}{72} = \frac{1}{48}$

$\text{Drawing} = \frac{72}{48} = 1\frac{1}{2}$ in.

b. 48 in = 4 ft ; Drawing = 1 in.

36 in = 3 ft ; $\frac{\text{Drawing}}{3} = \frac{1}{4}$, $\text{Drawing} = \frac{3}{4}$ in.

c. $\frac{\text{Drawing}}{9} = \frac{1}{4}$, $\text{Drawing} = \frac{9}{4} = 2\frac{1}{4}$ in.

5. $\frac{\text{AB Drawing}}{\text{AB Actual}} = \frac{1}{2}$ (Scale) ;

$\frac{2\frac{1}{2}}{\text{AB Actual}} = \frac{1}{2}$, AB Actual = 5".

For BC: $\frac{\frac{1}{2}}{\text{Actual}} = \frac{1}{2}$; Actual = 1 in.

For CD, $\frac{1\frac{1}{2}}{\text{Actual}} = \frac{1}{2}$; Actual = 3 in.

For DE, $\frac{\frac{1}{4}}{\text{Actual}} = \frac{1}{2}$; $\text{Actual} = \frac{2}{4} = \frac{1}{2}$ in.

For EF, $\frac{1}{\text{Actual}} = \frac{1}{2}$; Actual = 2 in.

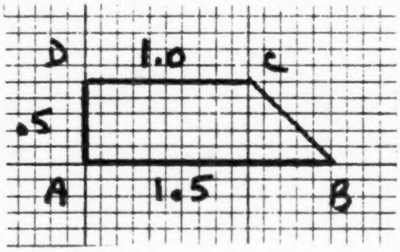
For FA, $\frac{\frac{3}{4}}{\text{Actual}} = \frac{1}{2}$; $\text{Actual} = \frac{3}{2}$ in.

6. For AB, $\frac{\text{Drawing}}{\text{Actual}} = \frac{1}{3}$; $\frac{\text{Drawing}}{4.5} = \frac{1}{3}$

Drawing = 1.5 in.

Then for AD, Drawing = .5 in.

DC, Drawing = 1.0 in.



SUMMARY:

Ask, "How are scale drawing used?" What proportion is used in applying scale drawing?"

CONSUMER MATHEMATICS
MATHEMATICS IN THE HOME
LESSON: 6

AIM: How do we design a floor plan?

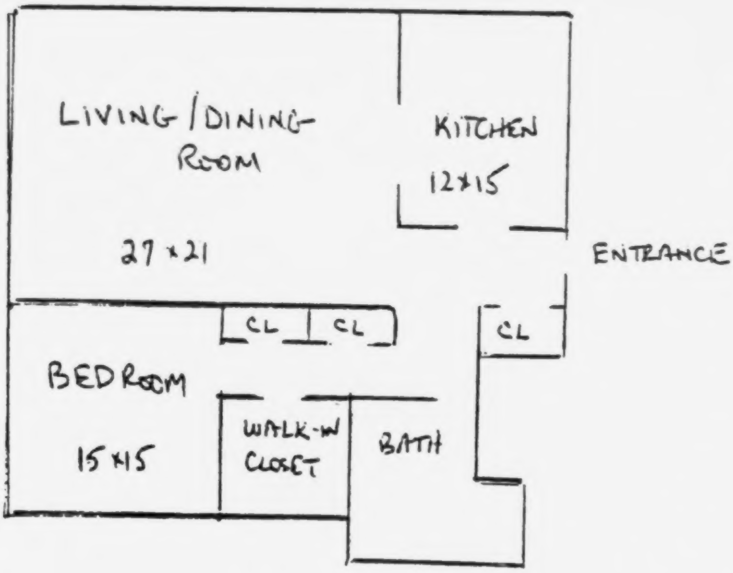
PERFORMANCE OBJECTIVES: The student will be able to...

1. Determine the scale dimensions of rooms in an apartment floor plan using a predetermined scale.
2. Choose an appropriate scale for his/her own floor plan design.
3. Draw a scale drawing of a floor plan design on graph paper.

VOCABULARY: floor plan

MOTIVATION:

Ask, "If you could design the plan of your own future apartment, what would it look like?"
Bring to class: Plans of apartments or houses as found in newspapers or magazines. Distribute these to the class.


LIVING/DINING ROOM
27 × 21
KITCHEN
12×15
ENTRANCE
CL
CL
CL
BEDROOM
15×15
WALK-IN CLOSET
BATH

SAMPLE FLOOR PLAN

DEVELOPMENT:

1. Ask, "In drawing the floor plan, how long should each wall be?" Elicit that a floor plan could be a scale drawing and that a given scale would be used to find the lengths of walls in the drawing. Suggest that students use a scale in the range of 1 inch to 8 feet through 1 inch to 12 feet.

2. Ask the class to determine the drawing dimensions of a room 9 ft x 12 ft using a scale suggested above. Elicit:

   $$\frac{\text{Drawing}}{9} = \frac{1}{8}, \text{ Drawing} = \frac{9}{8} = 1\frac{1}{8} \text{ in.}$$

   $$\text{or } \frac{\text{Drawing}}{9} = \frac{1}{12}, \text{ Drawing} = \frac{9}{12} = \frac{3}{4} \text{ in.}$$

   For 12 ft, Drawing = $1\frac{1}{2}$ in.
   or Drawing = 1 in.

3. Distribute graph paper. Ask, "If the graph paper has 4 squares per inch, how many feet will each square represent, using:
   a) A scale of 1 in to 8 ft. (Answer: 2 ft/sq)
   b) A scale of 1 in to 12 ft. (Answer: 3 ft/sq)

4. Ask the class to estimate the dimensions of the classroom. Compare student estimates to actual dimensions.

APPLICATIONS:

1. Find the floor plan dimensions of a 15 x 18 ft living room using:
   a) 1 inch to 8 ft.
   b) 1 inch to 12 ft.

2. Design a floor plan of a one bedroom apartment.

3. Design a floor plan of a two bedroom apartment or a house.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) $\frac{\text{Plan}}{15} = \frac{1}{8} \rightarrow \text{Plan} = \frac{15}{8} = 1\frac{7}{8}$ in

$\frac{\text{Plan}}{18} = \frac{1}{8} \rightarrow \text{Plan} = \frac{18}{8} = 2\frac{1}{4}$ in

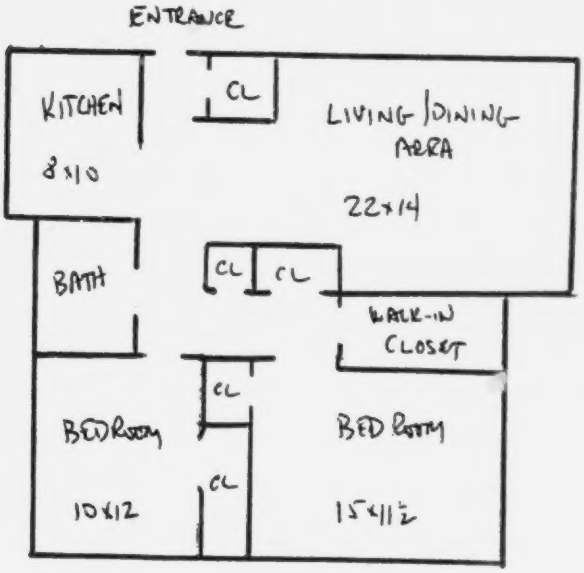
b) $\frac{\text{Plan}}{15} = \frac{1}{12} \rightarrow \text{Plan} = \frac{15}{12} = 1\frac{1}{4}$ in

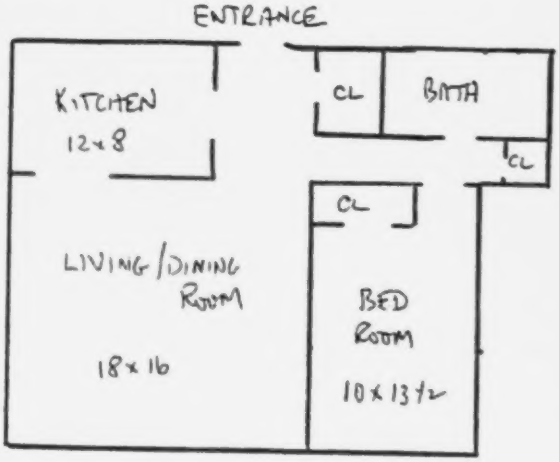
$\frac{\text{Plan}}{18} = \frac{1}{12} \rightarrow \text{Plan} = \frac{18}{12} = 1\frac{1}{2}$ in

2, 3. Sample floor plans follow:

SUMMARY:

1. Ask, "How can you determine the dimensions to use in a floor plan?" (By the scale and the actual dimensions.)


ENTRANCE
KITCHEN
8x10
CL
LIVING/DINING AREA
22x14
BATH
CL
CL
WALK-IN CLOSET
CL
BEDROOM
BED ROOM
CL
10x12
15x11½


ENTRANCE
KITCHEN
12x8
CL
BATH
CL
CL
LIVING/DINING ROOM
18x16
BED ROOM
10x13½

Scale: $\frac{3}{4}$ inch to 8 feet

CONSUMER MATHEMATICS
MATHEMATICS IN THE HOME
LESSON: 7

AIM: How do we solve verbal problems using perimeter?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Compute the perimeter of various polygons.
2. Determine the quantity of material (fencing, molding, hedging, etc.) required to enclose various regions.
3. Determine the cost of enclosing these regions.

VOCABULARY: perimeter

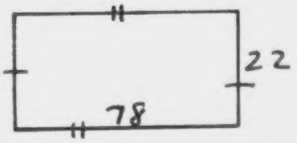
MOTIVATION:

The Fifth Street Block Association wishes to enclose a lawn 22 ft wide and 78 ft long. How can it determine the cost of a fence around the lawn?

DEVELOPMENT:

1. Elicit that the perimeter measures the distance around a region and that the total cost can be found by multiplying the cost of the fence per foot by the perimeter.

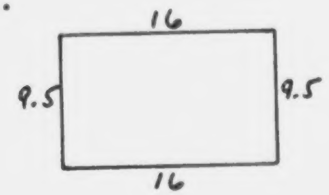
2. If fence material costs \$2.50 per foot, ask the class to find the cost of the entire fence. Elicit that the perimeter of the lawn is
78 + 22 + 78 + 22 = 200,
or 2(78+22) = 200 ft.
The fence will cost
\$2.50 x 200 = \$500.00



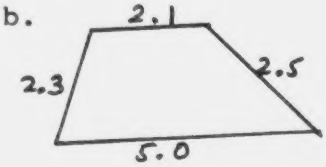
APPLICATIONS:

1. Determine the perimeter of each of the following:

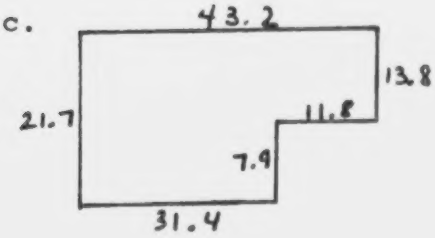
a.



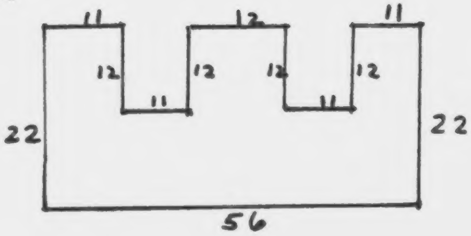
b.



c.



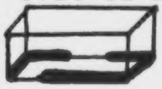
d.



2. A picture to be hung on a wall is 18 inches long and 24 inches wide. The picture must first be framed. How much frame material is needed? Find the cost of the frame if the frame material costs $.15 per inch.

3. A picture window 51 inches by 27 inches must be weather stripped. If weather stripping costs $.18 per foot, find the cost of preparing the window.

4. A rectangular room 3 meters by 3.4 meters is, being wall papered. A molding is placed along the wall where it meets the floor (except for a total of 1.8 meters for the room and closet doors). The cost of molding is $1.48 per meter. Find the cost of molding needed for the room.



5. Each side of an octangonal table has a length of 2 feet 3 inches. Each side must be "finished-off" with a formica strip. Find the cost of "finishing-off" the table if formica stripping costs $.49 per foot.

6. The Fifth Street Block Association wishes to plant a garden on its property. The garden, 22 feet by 18 feet, will be bordered by a hedge. Find the cost of enclosing

the garden (except for a four foot entrance on each side) if hedge costs $.85 per foot.

SOLUTIONS TO APPLICATION PROBLEMS:

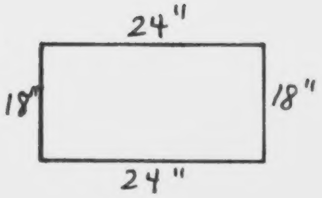
1. a) 9.5 + 16 + 9.5 + 16 = 51 or 2(16+9.5) = 51

   b) 2.3 + 2.1 + 2.5 + 5.0 = 11.9

   c) 21.7 + 43.2 + 13.8 + 11.8 + 7.9 + 31.4 = 129.8
   or
   2(21.7+43.2) = 129.8

   d)
   $$\begin{array}{r} 22 \times 2 = 44 \\ 11 \times 4 = 44 \\ 12 \times 5 = 60 \\ \underline{56} \\ 204 \end{array}$$

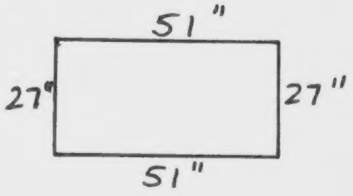
2.



Perimeter = 2(18+24) = 84"

Cost of frame = .15x84 = $12.60

3.



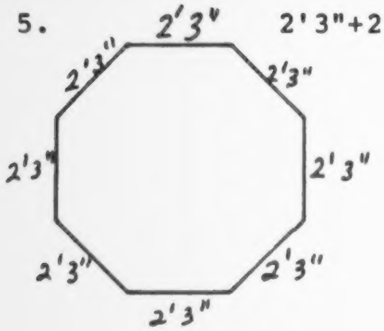
Perimeter = 2(27+51) = 156"

Perimeter in terms of feet =
= 156" ÷ 12
= 13 ft

Cost of weather-stripping =
= 13' x .18
= $2.34

4. 3 + 3.4 + 3 + 3.4 = 12.8 meters
   12.8 meters - 1.8 meters = 11 meters
   Cost: 11 meters x $1.48 per meter = $16.28

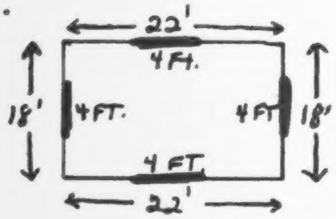
5.


2'3"
2'3"
2'3"
2'3"
2'3"
2'3"
2'3"
2'3"

2'3"+2'3"+2'3"+2'3"+2'3"+2'3"+2'3"+2'3" = 18'

18' x .49 per foot = $8.82

6.


22'
4 Ft.
18'
4 FT.
4 FT
18'
4 FT.
22'

Perimeter = 2(18'+22') = 80

80'-16'(entrances) = 64'

Cost = 64' x .85 per foot = $54.40

SUMMARY:

Ask, "How do we find the perimeter of a figure?" "How can we use the perimeter to find the cost of enclosing a region?"

CONSUMER MATHEMATICS

MATHEMATICS IN THE HOME

LESSON: 8

AIM: How do we solve verbal problems using circumference?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Compute the circumference of a circle. Given the radius or diameter.
2. Find the radius of a circle with given circumference.
3. Find the length of an arc of a circle.
4. Compute the cost of enclosing a circular region.

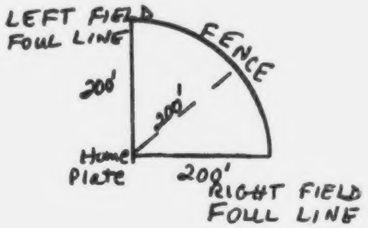
VOCABULARY: circumference, arc, radius, diameter, central angle

MOTIVATION:

A little league outfield fence is 200 feet from homeplate everywhere in fair territory. What geometric figure describes the shape of the fence?

DEVELOPMENT:

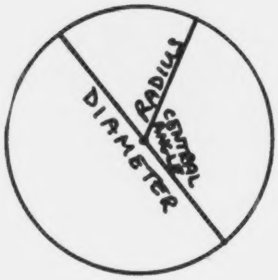
1\.



Elicit that since the fence is always the same distance from a point (homeplate) it is part of a circle. Ask, "What fraction of a whole circle is it? Elicit that since the two foul lines form a right angle at homeplate, the fence is a quarter of a circle ; $\frac{90^\circ}{360^\circ} = \frac{1}{4}$

Define a) Circumference - The distance around a circle.

b) Arc - A part of the circumference of the circle.



c) Radius - The line segment from the center of the circle to the circumference of the circle.

d) Diameter - The line segment from a point on the circle to another point on the circle, passing through the center of the circle.

Ask "How does the length of a diameter compare to that of a radius?" (Diameter = 2 times radius.)

2. Explain that for all circles the ratio circumference/diameter equals a constant value, called π (Pi), and approximately equals 3.14. Therefore $\pi = \frac{C}{d}$ or $C = \pi \cdot d$, or $C = \pi \cdot (2r) = 2\pi r$. Also, then $r = \frac{C}{2\pi}$. Show that if the radius of a circle is 200 feet, the circumference is approximately 2(3.14)(200) = 1256 feet, and that if the circumference is 1000 feet, the radius is approximately $\frac{1000}{2(3.14)} = \frac{1000}{6.28} = 159.2$ feet.

3. Ask, "If the circumference of a circle with radius 200 feet is 1256 feet, how long is the circular fence in the outfield?" (Since the fence is $\frac{1}{4}$ of the circumference, it must be $\frac{1}{4}(1256)$ or 314 feet long.) Ask, "How much would the fence cost at $2.50 per foot?" ($785.00)

4. Present the problem, "If the angle between two radii is known, how can we find the fraction of the whole circle that the arc represents?" Show that the arc is the same fraction of the circle that the angle is of 360°. That is, if the angle between the radii is 60°, the arc is $\frac{60}{360} = \frac{1}{6}$ of the circle. An angle of 135° results in an arc which is $\frac{135}{360} = \frac{3}{8}$ of the circle. Define: **Central Angle:** The angle formed by 2 radii intersecting at the center of the circle.

APPLICATIONS:

1. Find the circumference of each circle if:

   a) $r = 2$ ft. b. $4 = 18$ cm c. $d = 9$ in.

2. Find the radius of each circle if:

   a) $c = 400$ ft. b. $c = 180$ in. c. $c = 60$ cm

3. Find the length of an arc given the following radii and central angles:

	Radius	Central Angle
a)	8 in.	30°
b)	4.3 ft.	60°
c)	12.5 cm	72°
d)	.42 m	120°
e)	6 km	150°

4. The edge of a circular table is decorated with ribbon. How long must the ribbon be to fit around the table if the diameter is 50 inches? Find the total cost if ribbon costs $.05 per inch.

5. A pizza pie with an 8 inch diameter is ordered with sesame seeds baked around the crust. If 1 inch of crust contains 20 seeds, how many seeds are needed for the whole pie?

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) $C = 2\pi r = 2(3.14)(2) = 12.56$ ft. Approximately

   b) $C = 2\pi r = 2(3.14)(18) = 113.04$ cm

   c) $C = \pi d = (3.14)(9) = 28.26$ in.

2. a) $r = \frac{C}{2\pi} = \frac{400}{2(3.14)} = 63.69$ ft. Approximately

   b) $r = \frac{C}{2\pi} = \frac{180}{2(3.14)} = 28.66$ in.

   c) $r = \frac{C}{2\pi} = \frac{60}{2(3.14)} = 9.55$ cm

3. a) arc = $\frac{30}{360}$; L = $\frac{30}{360} \cdot 2(3.14)(8) = 4.19$ in.

   b) arc = $\frac{60}{360}$; L = $\frac{60}{360} \cdot 2(3.14)(4.3) = 4.50$ ft.

   c) arc = $\frac{72}{360}$; L = $\frac{72}{360} \cdot 2(3.14)(12.5) = 15.70$ cm

   d) arc = $\frac{120}{360}$; L = $\frac{120}{360}$ $2\pi(.42) = .88$ m

   e) arc = $\frac{150}{360}$; L = $\frac{150}{360}$ $2\pi(6) = 15.7$ km

4. $C = 2\pi r = \pi d = 3.14(50) = 157$ in.
   cost = .05(157) = \$7.85

5. $C = \pi d = 3.14(8) = 25.12$ in.
   number of seeds = 20(25.12) = 502.4 or 503, since the baker won't cut a seed into a fractional part.

SUMMARY:

Ask the class to describe how the length of an arc is found. (It is a fraction of the circumference, the same fraction as central angle/360°.)

CONSUMER MATHEMATICS
MATHEMATICS IN THE HOME
LESSON: 9

AIM: How do we solve verbal problems using area?

PERFORMANCE OBJECTIVES: The student will be able to...

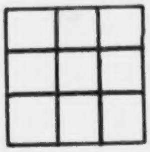
1. Compute the area of:
   a) Triangles
   b) Rectangles
   c) Parallelograms
   d) Trapezoids
2. Compute the quantity of material and cost of material used in floor and wall coverings.

MOTIVATION:

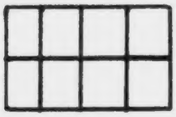
Ask, "How can you determine the number of rolls of wallpaper needed to cover the walls of your bedroom?"

DEVELOPMENT:

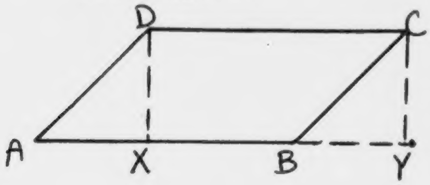
1. Elicit that the larger the room, the more wall paper needed, and that the amount of paper depends on the area of the walls. Ask, "How is area measured?" (In square units, ie., How many squares, with side equal to 1 unit, fit into a given region?) Example, the area of a square, 3 feet on each side, is 9 sq ft.



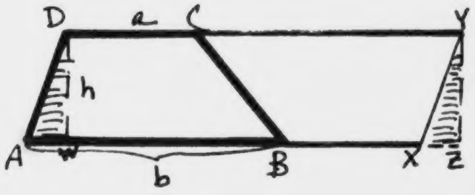
2. Elicit that the number of squares in a rectangle is the length times the width.



Demonstrate that the area of a parallelogram and of a trapezoid can be found by rearranging regions to form rectangles.



Parallelogram ABCD has the same area as Rectangle XYCD.


D
a
C
Y
h
A
W
b
B
X
Z

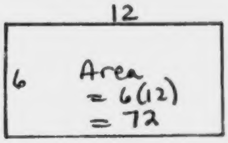
Trapezoid ABCD is "flipped over and sideways" to form BXYC. Triangle AWD is cut out and moved over to form triangle XZY. Now ABCD is half of rectangle WZYD. This leads to the formulas:

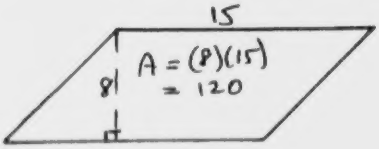
Area = b·h for Parallelogram

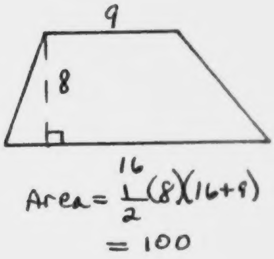
Area = $\frac{1}{2}h(a+b)$ for Trapezoid

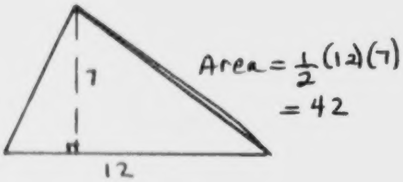
Elicit that the area of a triangle is $\frac{1}{2}b \cdot h$.

3. Examples


12
6
Area
= 6(12)
= 72


15
8
A = (8)(15)
= 120


9
8
16
Area = ½(8)(16+9)
= 100


7
12
Area = ½(12)(7)
= 42

All of the above results are in square units.

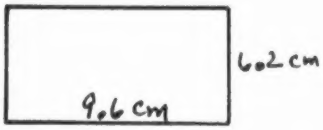
4. Ask, "How can we find the number of rolls of wallpaper needed to cover 4 walls, each 8 ft. high and 12 ft. long, if 1 roll covers 60 square feet?" Elicit that we must find the total area first, then divide by 60.

$$4 \text{ walls} \times \underbrace{8 \text{ ft.} \times 12 \text{ ft.}}_{\text{Area of each wall.}} = 384 \; ; \; 384 \div 60 = 6.4$$

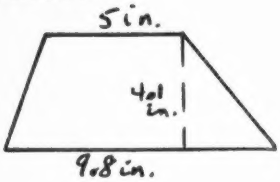
Ask, "Can we buy 6.4 rolls?" (Probably not.) As a result, we need 7 rolls. Ask, "What should we do to find the cost for the room?" Elicit that we multiply the cost of one roll by 7.

APPLICATIONS:

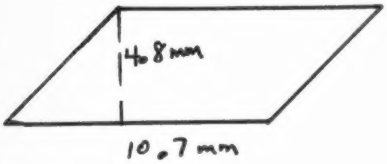
1. Find the areas of each figure.
   a) Rectangle



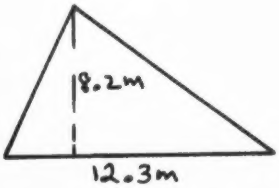
   b) Trapezoid



   c) Parallelogram



   d) Triangle



2. A bedroom 12 ft. by 14 ft. by 9 ft. high is to have four walls covered with wallpaper. Find the area to be covered. If each roll of wallpaper covers 60 square feet and costs $13.95 per roll, find the cost of the project.

3. Gymnasium mats are made to order and cost $2.25 per square foot. Find the cost of each mat.
   a) 4 ft by 6 ft
   b) 8 ft by 12 ft
   c) Compare each dimension of (a) with its corresponding dimension of (b).
   d) Is the change in costs predictable?

4. Room air conditioners are rated in BTU (British Thermal Units), the amount of heat needed to raise the temperature of 1 pound of water 1°F. The size of an air conditioner needed for a room can be found by multiplying the area by 24, ie., BTU = 24T, with T = area in sq. ft. Find the size air conditioner needed to cool the following rooms:
   a) Bedroom 11 ft. by 14 ft.
   b) Bedroom 12 ft. by 15 ft. 6 in.
   c) Living room, dining room combination
      18 ft. by 12 ft. and 9 ft. by 12 ft.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) $(9.6)(6.2) = 59.52$ sq. cm
   b) $\frac{1}{2}(4.1)(5+9.8) = 30.34$ sq. in.
   c) $(4.8)(10.7) = 51.36$ sq. mm
   d) $\frac{1}{2}(8.2)(12.3) = 50.43$ sq. m

2. Each wall is either 14 ft or 12 ft by 9 ft. The four areas are $14\cdot9$, $12\cdot9$, $14\cdot9$, $12\cdot9$. The total area is $2(14\cdot9+12\cdot9) = 468$ sq. ft.
   Number rolls = 468/60 = 7.8 or 8 rolls.
   Cost = 8 x $13.95 = $111.60

3. a) Area = 4 x 6 = 24 sq. ft.
      Cost = 24 x 2.25 = $54.00
   b) Area = 8 x 12 = 96 sq. ft.
      Cost = 96 x 2.25 = $216.00
   c) each dimension is doubled
   d) cost is quadrupled, not doubled

4. a) Area = 11 x 14 = 154 sq. ft.
BTU = 24 x 154 = 3,696

b) Area = 12 x $15\frac{1}{2}$ = 186 sq. ft.
BTU = 24 x 186 = 4,464

c) Area = 18 x 12 + 9 x 12 or (18+9)x12 = 324 sq. ft.
BTU = 24 x 324 = 7,776

SUMMARY:

Ask, "How can we find the cost of covering a room with carpet?" Elicit find the area and multiply by the cost per unit.

CONSUMER MATHEMATICS

MATHEMATICS IN THE HOME

LESSON: 10

AIM: How do we solve surface area problems?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Compute the surface area of rectangular solids, pyramids and frustums.
2. Compute the amount of material and cost of material required to manufacture or cover items with shapes indicated above.

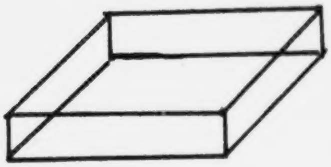
VOCABULARY: surface area, pyramid, frustum

MOTIVATION:

Ask, "How much wrapping paper is needed to cover a box 12 in. long, 8 in. wide and 2 in. high?

DEVELOPMENT:

1. Elicit that this involves the area of all the surfaces, top, bottom, front, back, right and left.

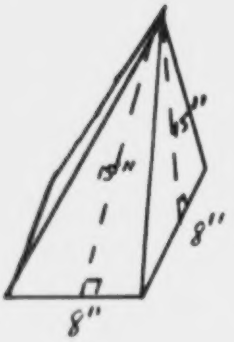


Ask, "What are the areas of these surfaces?"

(Top: 12x8 = 96 sq. in.
Bottom: same, 96
Front: 12x2 = 24 sq. in.
Back: same, 24
Right: 2x8 = 16 sq. in.
Left: same, 16
Total: 96+96+24+24+16+16 = 272 sq. in.)

Therefore 272 sq. inches of wrapping paper are needed.

2. Ask, "While the surfaces of the box were all rectangles, what would the surfaces of a pyramid be?"

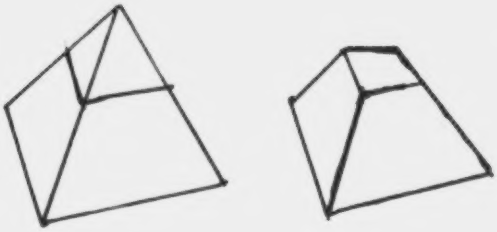


Elicit that the "side" surfaces are triangles and the base is a square.

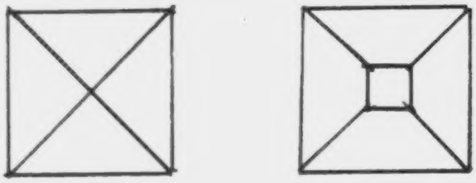
Elicit that the surface area Here is $4(\frac{1}{2}\cdot 8\cdot 15)+8\cdot 8$
$= 240+64 = 308$

Note, the length 15" is the slant height of the surface, not an altitude of the solid.

3. Develop that if we "slice" a pyramidal solid off the top of a pyramid, what is left is called a frustum. If the "slice" is made parallel to the base, elicit that each "side" surface is a trapezoid, and the top and bottom are squares.



Perspective View



Top View

4. Elicit that the surface area of a frustum would include 2 squares and 4 trapezoids.

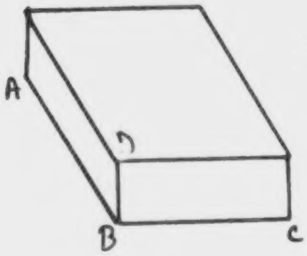
   Example, find the surface area of a frustum with bottom base 6 inch square, upper base 2 inch square, and slant height of each trapezoidal surface 5 inches.

Top	$2\times 2 = 4$
Bottom	$6\times 6 = 36$
Sides	$\frac{1}{2}$ $\cdot 5\cdot (6+2) = 20$ each
Total	$4+36+4\cdot 20 = 40+80 = 120$ sq. in.

APPLICATIONS:

Find the surface area of each solid.

1.



A) AB=8, BC=6

BD=3

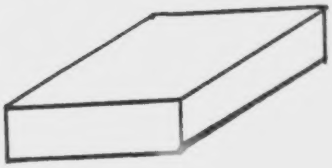
B) AB=7

BC=8

BD=4

Rectanglar Solid
(Box)

2.



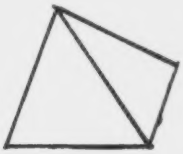
AB=12

BD=4

BC=8

Rectanglar Solid

3.

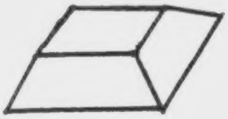


Pyramid
(Base is square)

a) side of base = 6
slant height = 9

b) side of base = $4\frac{1}{2}$
slant height = 8

4.



Frustum
(Both bases square)

side of upper base = 6
side of lower base = 8
slant height = 2.5

5. A rectangular box 4 in. by 6 in. by $2\frac{1}{4}$ in can be decorated at a cost of $.12 per square inch of surface. Find the cost of decoration.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 8(6) + 8(6) + 6(3) + 6(3) + 8(3) + 8(3) = 180 sq. units
   b) 7(8) + 7(8) + 8(4) + 8(4) + 4(7) + 4(7) = 232 sq. units

2. 12(4) + 12(4) + 4(8) + 4(8) + 12(8) + 12(8) = 352 sq. units

3. a) $6(6) + 4\left[\frac{1}{2}(9)(6)\right] = 36+108 = 144$ sq. units

   b) $(4\frac{1}{2})(4\frac{1}{2})+4\left[\frac{1}{2}(4\frac{1}{2})(8)\right] = 20.25+72 = 92.25$ sq. units

4. $6(6) + 8(8) + \frac{1}{2}(2.5)(6+8) = 36+64+17.5 = 117.5$ sq. units

5. Surface area = $4(6)(2\frac{1}{4}) = 54$ sq. in.
   Cost = $.12(54) = \$6.48$

SUMMARY:

Ask, "Describe a procedure for computing surface area." (Find the area of each surface and find the sum of these areas.)

CONSUMER MATHEMATICS

MATHEMATICS IN THE HOME

LESSON: 11

AIM: How do we solve area problems using circles?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Compute the area of circles.
2. Compute the area of sectors of circles.
3. Compute the amount of material needed to manufacture or cover circular regions.
4. Determine the cost of materials indicated above.

VOCABULARY: sector

MOTIVATION:

Ms. Spade decided to install a circular pool. The gardener recommended she cover the pool. If the pool was 10 feet in diameter, how much material was needed to cover the pool?

DEVELOPMENT:

1. Using the motivation problem, determine that we must know the area of the pool. Ask: "What is the formula for finding the area of a circle? Elicit: πr^2 where r equals the radius of the circle.

   Review Area of a Circle = πr^2.

   Ask: "Using 10 feet as the diameter, calculate the area of this circular pool in terms of π." Elicit: Radius equals 10/2 or 5 feet then Area = $\pi(5)^2 = 25\pi$.

   Review approximate values of π: 22/7, 3.14. Stress that these values are only approximations.
2. Emphasize that answers to area of circle problems may be left in terms of π unless specific mention is made to using 22/7 or 3.14.
3. Do Application #1.

4. Refer to a piece of pie or a slice of pizza and define a sector of a circle as a part of the circle formed by two radii.

5. Ask: "If a circle has a radius of 4", find the area of a sector of the circle which is 1/4 of the circle." Elicit: Area of the circle = $\pi(4)^2 = 16\pi$. Sector is $1/4(16\pi) = 4\pi$.

6. Do Application #2.

7. Do Application #3.

8. Refer to motivation problem: Ask: "If Ms. Spade must pay $5 per sq. ft. for material for the pool, what is the total cost of the material?" (Use $\pi = 3.14$.) Elicit: (3.14)(25) x $5 = $392.50.

9. Do Application #4.

APPLICATIONS:

1. a) Find the area of a circle whose radius is 6". (Leave answer in terms of π.)
   b) Find the area of a circle whose diameter is 14'. (Leave the answer in terms of π.)
   c) Find the area of a circle whose radius is 14". (Use $\pi = 22/7$.)
   d) Find the area of a circle whose diameter is 16'. (Use $\pi = 3.14$.)

2. Find the area of each sector of the circle. (Leave answers in terms of π.)
   a) r = 12", sector is half the circle.
   b) r = 15', sector is 1/3 of the circle.
   c) d = 24", sector is 1/4 of the circle.
   d) d = 36", sector is 3/4 of the circle.

3. How much material must be used to cover a circular pool whose radius is 21'. (Use $\pi = 22/7$.)

4. a) Find the cost of the material in part 3 if the material costs $.25 per square foot.
   b) Which will serve more people: Two 14" diameter pizzas or four 8" diameter pizzas.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 36π sq. in. b) 49π sq. ft.
   c) 616 sq. in. d) 200.96 sq. ft.
2. a) 72π sq. in. b) 75π sq. ft.
   c) 36π sq. in. d) 243π sq. in.
3. 1386 sq. ft.
4. a) $346.50
   b) Two 14" pizzas.

SUMMARY:

1. How do we find the area of a circle?
2. How do we find the area of a sector of a circle?
3. How do we determine the total cost of covering a circular object?

CONSUMER MATHEMATICS

MATHEMATICS IN THE HOME

LESSON: 12

AIM: How do we find volumes of solids?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Compute the volume of rectangular solids.
2. Compute the volume of cylinders.
3. Compute the volume of spheres.

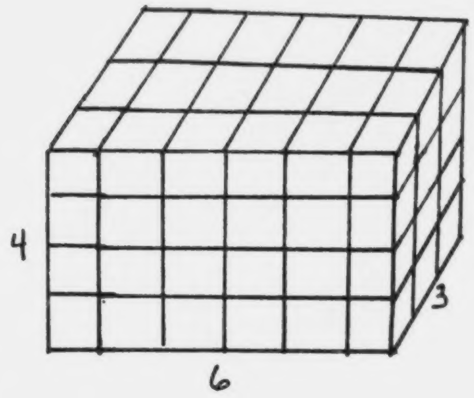
VOCABULARY: rectangular solids, cylinders, spheres

MOTIVATION:

How much more helium is required to inflate a spherical balloon with diameter 14" than is needed for a balloon with 8" diameter?

DEVELOPMENT:

1. Using the motivation problem, ask: "How will we determine which balloon is larger?" Elicit: Find the volume of each balloon.
2. Define volume as the amount of space occupied by an object.
3. Use models of solids: rectangular solids, cylinders and spheres. Demonstrate the concept of volume as the number of cubic units an object occupies.



4. Ask: "How many cubic units are in the rectangular solid in part 3?" Elicit: 72. Ask: "How can we find the volume of a rectangular solid given the dimensions 4' by 6' by 3'?" Elicit: Multiply 4 x 6 x 3.
   Develop the formula:
   Volume of a rect. solid = length x width x height.

5. Do Application #1.

6. Ask: "How can we find the volume of a cylinder?"
   Elicit: The base of the cylinder is a circle. Find the area of the circle and multiply by height.
   Develop the formula:
   Volume of a cylinder = $\pi r^2 h$. Review approximate values of π.

7. Do Application #2.

8. Use the motivation problem and state the formula for the volume of a sphere. Volume of a sphere = $\frac{4}{3}\pi r^3$. Complete the problem.
   14" balloon: $V = \frac{4}{3}\pi(7)^3$ 457.3π.
   8" balloon: $V = \frac{4}{3}\pi(4)^3$ 85.3π.
   If we use $\pi = 3.14$ then the difference is approximately 1168 cu. in of helium.

9. Do Application #3.

APPLICATIONS:

1. a) Find the volume of each rectangular solid:
      1) $l = 5$ cm, $w = 3.2$ cm, $h = 10.6$ cm.
      2) $l = 7\frac{1}{2}$", $w = 4\frac{1}{2}$", $h = 2$".
   b) Find the volume of a cube whose edge is 3'.

2. Find the volume of each cylinder: (Leave answers in terms of π.)
   1) Area of base = 17 sq. yd., h = 2.6 yd.
   2) Radius of the base = 5 cm., h = 50 cm.

3. Find the volume of a sphere with diameter 16 meters. (Use $\pi = 3.14$.)

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 1) 169.6 cu. cm.
   2) 67.5 cu. cm.
   b) 27 cu. ft.

2. 1) 44.2 cu. yd.
   2) 1250π cu. cm.

3. 2143.57 cu. cm.

SUMMARY:

1. What is meant by volume?
2. How do we find the volume of a rectangular solid?
3. How do we find the volume of a cylinder?
4. How do we find the volume of a sphere?

CONSUMER MATHEMATICS
MATHEMATICS IN THE HOME
LESSON: 13

AIM: How do we solve verbal problems involving volume?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Determine the quantities necessary to fill solid figures.
2. Determine the costs of materials used to fill these solids.
3. Solve similar verbal problems involving volume.

MOTIVATION:

A cubic foot of steel weighs 400 pounds. What is the weight of a steel ball 12 in diameter?

DEVELOPMENT:

1. Using the motivation problem ask: "Before we can calculate the weight of the ball, what information must we know?" Elicit: The volume of the sphere.
   Ask: "What clue word in the problem indicates the need to know volume?" Elicit: Cubic foot.
   Review: Volume of a sphere = $\frac{4}{3}\pi r^3$.
2. Do Application #1.
3. Ask: "If 1 cu. ft. of water weighs 62.4 lbs. and we wish to find the weight of the water in a rectangular fish tank which measures 2' by 3' by 1', what information must we know?" Elicit: The volume of the fish tank.
   Ask: "What clue word in the problem indicated the need to know volume?" Elicit: Cubic foot.
   Review: Volume of a rect. solid = l x w x h.
4. Do Application #2.
5. It costs 4 cents per cubic inch to fill a cylindrical can of paint. If the paint can has a base whose radius is 4" and a height of 9", what information do we need to find in order to calculate the total cost of filling this paint can?"

Elicit: The volume of the can. **Ask:** "How can we determine that the volume of the can must be found?
Elicit: Cubic inch.
Review: Volume of a cylinder = $\pi r^2 h$.

6. Do Application #3.

APPLICATIONS:

1. a) Complete the motivation problem. (Use π = 3.14.)
   b) If 1 cu. ft. of water weighs 62.4 lbs, what is the weight (to the nearest pound) of the water in a spherical tank of radius 3 feet, when the tank is full? (Use π = 3.14.)
2. a) Complete the development problem part 3.
   b) A 15' by 30' rectangular swimming pool is filled to an average depth of 6'. If 1 cu. ft. holds $7\frac{1}{2}$ gallons of water, how many gallons of water does the pool hold?
3. a) Complete the development problem part 5. (Use π = 3.14.)
   b) How many cubic feet will be removed digging a 7' deep hole with a diameter of 2'. (Use π = 22/7.)

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 209.3 lbs. Remember 6" = 1/2 ft.
   b) 7054 lbs.
2. a) 374.4 lbs.
   b) 20,250 gallons
3. a) $18.09
   b) 22 cu. ft.

SUMMARY:

1. What is the formula for finding the volume of a sphere? Cylinder? Rectangular solid?
2. What clue word in a verbal problem usually indicates the need to use a volume formula?

MATHEMATICS IN THE HOME

LESSON: 14

AIM: How do we determine power consumption?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Define watt, kilowatt and kilowatt hour.
2. Compute the number of kilowatt hours used in a household appliance.

VOCABULARY: watt, kilowatt, kilowatt hour (KWH)

MOTIVATION:

What is the difference between using a 40-watt and a 60-watt lightbulb in your desk lamp?

DEVELOPMENT:

1. Using the motivation problem, develop the idea that a 60-watt lightbulb is brighter than a 40-watt bulb.
   Ask: "Why is the 60-watt bulb brighter?"
   Elicit: There is more energy flowing through the bulb.
2. Define watt as the measure of the total energy flowing in an electric circuit at a given moment. Therefore a 60-watt bulb uses 60 watts of electricity every moment it is turned on.
3. Ask: "What is a kilowatt?" Elicit: 1000 watts of electricity. Ask: "What is a kilowatt hour?" Elicit: 1000 watt hours. (For example a 100-watt bulb which burns for 10 hours uses 1000 watt hours of electricity. 1000 watt hours divided by 1000 watts = 1 kilowatt hour (KWH).)
   Establish: Number of watt hours = number of watts in an appliance x amount of time used.
   Number of kilowatt hours = number of watt hours divided by 1000.
4. Do Application #1.

5. Do Application #2.

6. Do Application #3.

APPLICATIONS:

1. Calculate the number of watt hours for each of the following:

	# of Watts	Amt of Time Used	# of Watt hours
a)	100	40 hours	
b)	200	30 hours	
c)	75	20 hours	
d)	60	30 hours	
e)	300	12 hours	
f)	40	1/2 hour	

2. Calculate the number of kilowatt hours in each of the following:
   a) 4000 watt hours
   b) 10000 watt hours
   c) 7500 watt hours
   d) 200 watt hours

3. Calculate the number of kilowatt hours used by each of the following household appliances:
   a) 100-watt lightbulb used for 12 hours.
   b) 500-watt heater used for 2 hours.
   c) 250-watt toaster used for $1\frac{1}{2}$ hours.
   d) 750-watt electronic device used for 4 hours.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 4000 b) 6000 c) 1500
   d) 1800 e) 3600 f) 20

2. a) 4 b) 10 c) 7.5 d) .2

3. a) 1.2 b) 1 c) .375 d) 3

SUMMARY:

1. What is a watt? Kilowatt? Watt hour? Kilowatt hour (KWH)?

2. How can we calculate the number of watt hours?

3. How can we calculate the number of kilowatt hours?

CONSUMER MATHEMATICS
MATHEMATICS IN THE HOME
LESSON: 15

AIM: How can we compute the costs of electric appliances?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Compute the operating cost of electric appliances at a fixed cost per kilowatt hour.
2. Compute the monthly cost of several electric appliances on a sliding scale.
3. Compute the average annual cost of appliances based on depreciation, repair and operating costs.

VOCABULARY: depreciation

MOTIVATION:

The Robb's bought a small electric broiler to use instead of their stove. During the first month they used the broiler for 5 hours. If the average cost per kilowatt hour (KWH) is 6.07 cents, how much did they save by using the small broiler?

Broiler - 1140 watts
Stove - 12,200 watts

DEVELOPMENT:

1. Using the motivation problem, ask: "In order to calculate the cost, what information must we know first?"
   Elicit: The number of kilowatt hours (KWH).
   Review:
   Number of watt hours = number of watts in an appliance x amount of time used.
   Number of KWH = Number of watt hours/1000.
   Calculate:
   Small broiler - # of watt hours = 1140 x 5 = 5700
   # of KWH = 5700/1000 = 5.7
   Stove broiler - # of watt hours = 12,200 x 5 = 61,000
   # of KWH = 61,000/1000 = 61

2. Ask: "How can we determine the cost of operating each appliance?"

   Elicit: Multiply 6.07 cents by the # of KWH.

   Small broiler - 5.7 x .0607 = $ .35
   Stove broiler - 61 x .0607 = $3.70

3. Do Application #1.

4. Refer back to the motivation problem. Ask: "How much did the Robb's save by using the small broiler?"

   Elicit: $3.35

5. Do Application #2.

6. Indicate that sometimes the more electricity you use the cheaper each KWH costs. For example:

   YOUR CITY MONTHLY ELECTRIC RATES

First 250 KWH or less	4 cents/KWH
For each KWH over 250 KWH	3 cents/KWH

   Calculate the cost of running appliances that use 450 KWH.

   First 250 KWH = 250 x .04 = $10
   Next 200 KWH = 200 x .03 = $6
   Total $16

7. Do Application #3.

8. Students should be aware of other costs in using appliances. Ask: "Besides initial purchase costs and charge for electricity, what other costs do we consider in operating an appliance?" Elicit: repair and depreciation. Define depreciation as the loss in the value of an item each year.

9. Do Application #4.

APPLICATIONS:

1. Complete the table:

Appliance	Watts	Hours Used	Cost/KWH	Cost to operate
Broiler	1100	6.5	6¢	
Dishwasher	1300	40	5.5¢	
Stereo	80	100	7.01¢	
Vacuum	600	15.6	8¢	

2. a) Find the cost of operating Sam's 100-watt sewing machine for 12 hours at 5.7 cents per KWH.
   b) Find the cost of operating Mike's 4856-watt dryer for 27 hours at 6.45 cents per KWH.

3. METROPOLIS ELECTRIC COMPANY

First 300 KWH or less	5¢/KWH
For each KWH over 300 KWH	4.75¢/KWH

   Calculate the cost of running appliances that use 740 KWH.

4. A refrigerator costs $415. It is estimated to have a life of 16 years. Estimated repair costs over the 16 years are $100 and annual kilowatt usage is estimated to 1200 KWH. If each KWH costs 6.4 cents, compute the average annual cost of owning and operating the refrigerator.

SOLUTIONS TO APPLICATION PROBLEMS:

1.

Broiler	$ .43
Dishwasher	$2.86
Stereo	$ .56
Vacuum	$ .75

2. a) $ .07
   b) $8.46

3. $15 + $20.90 = $35.90

4.

Depreciation	$ 25.94 per year
Repair	$ 6.25 per year
Electricity	$ 76.80 per year
Total	$108.99 per year

SUMMARY:

1. How do we compute the cost of appliances at a fixed cost/KWH?

2. How do we compute the cost of appliances on a sliding scale?

3. What is meant by depreciation?

4. How do we calculate the annual costs of operating an appliance?

CONSUMER MATHEMATICS

MATHEMATICS IN THE HOME

LESSON: 16

AIM: How do we read utility meters?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Read a utility meter.
2. Determine the quantity of
   a) gas
   b) electricity
   c) water
   used by reading utility meters.

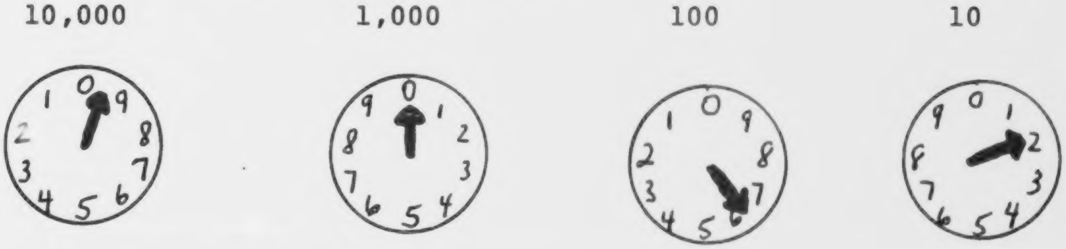
VOCABULARY: utility meter

MOTIVATION:

How do we determine how much electricity we use in a given month? Elicit: Read the electric meter.

DEVELOPMENT:

1. Using the motivation problem, show students a sample meter or picture of one. Ask: "Do any of you have other meters in your home?" Elicit: Gas or water meters. Define utility meter as a device that measures gas, electricity or water usage.
2. Demonstrate how to read a meter.



KILOWATT HOURS

Read as follows:

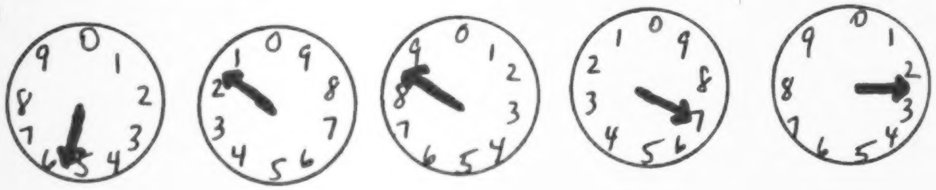
First reading - needle past 9 therefore reads	90,000 KWH
Second reading - needle at 0 therefore reads	0,000 KWH
Third reading - needle past 6 therefore reads	600 KWH
Fourth reading - on 2 therefore reads	20 KWH
Total reading is	90,620 KWH

3. Do Application #1.
4. Ask: "If the present reading is 90,620, how can we determine how much electricity was used this month?" Elicit: Find the reading from last month and subtract.
5. Do Application #2.
6. Do Application #3.

APPLICATIONS:

1. Read the following meters:

a)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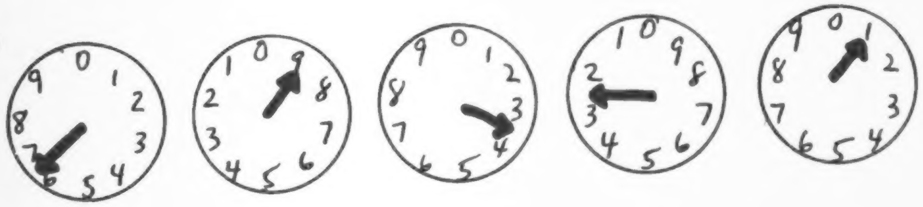
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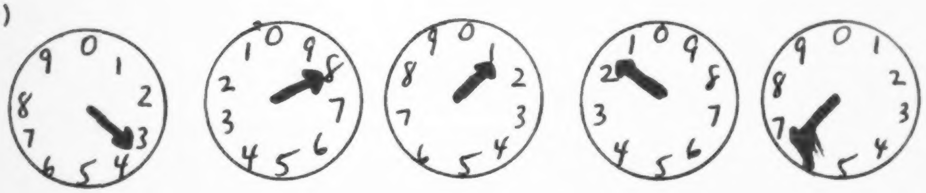
c)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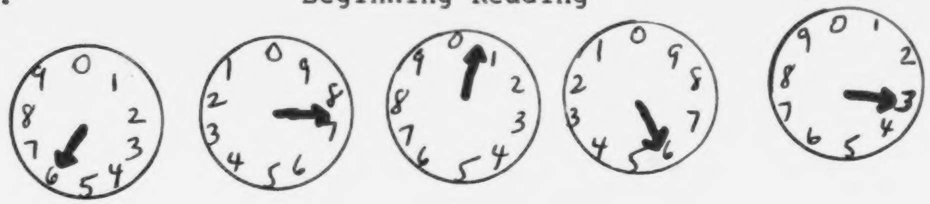
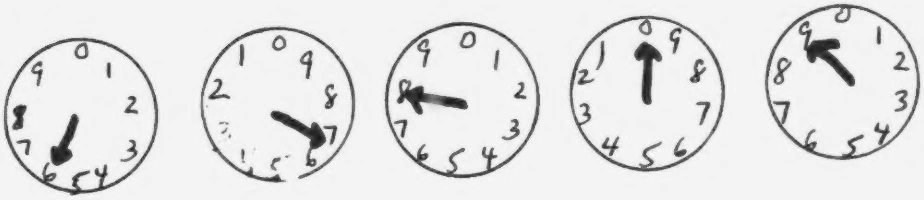
2. Find the number of kilowatt hours used in each case:

	Beginning Reading	Final Reading	Usage
a)	70631	71001	
b)	52714	52844	
c)	19088	19348	

3. Beginning Reading



End of Month Reading



How many kilowatt hours of electricity were used this month?

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 51872
   b) 69321
   c) 38116
2. a) 370
   b) 130
   c) 260
3. End of month - 67809
   Beginning - 67053 Usage = 756 KWH

SUMMARY:

1. How do we read a utility meter?
2. How can we determine the quantity used by reading a meter?

CONSUMER MATH

MATHEMATICS IN THE HOME

LESSON: 17

AIM: How do we read utility bills?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Determine the date, previous and present meter readings and total cost based on a given utility (gas, electricity, water) bill.
2. Anticipate the date of the next bill.
3. Verify the total amount due by computation.
4. Compute the average monthly cost per kilowatt hour or 100 cubic feet of gas or water based on a utility bill.

MOTIVATION:

Jody received her monthly electric bill in the mail. It indicated a usage of 822 KWH and the readings of the meter at the end of the current month and of the previous month. How can Jody determine if the 822 KWH is an accurate reading? Elicit: Subtract the previous meter reading from the present month's reading. (The teacher may wish to duplicate a sample electric bill or use an overhead projector.)

DEVELOPMENT:

1. Using the motivation problem, the students should see examples of utility bills. Use a sample electric bill as follows:

YOUR CITY ELECTRIC CO.

Jody Jenkins
400 East Street
Your City

PERIOD ENDING:
April 30

METER READINGS		USAGE
Previous	Present	
40520	41342	822 KWH

TOTAL	$73.16
ADJUSTMENT	2.40
TAX	5.30
PLEASE PAY	$80.86

Ask: "What other information does this bill give us?" Elicit: Name and address of the user, date of the bill, costs and what Jody must pay.

2. Do Application #1.
3. Present a gas bill:

BIG CITY GAS CO.

Bob Jones
100 Eton Ave.
Big City

Meter Readings

Previous	Present
699	743

Initial Period: 2-1
Ending Period: 2-28

Usage:__________100-cu. ft.

Cost	$8.49
Adjustment	- .54
Tax	1.15

TOTAL BILL $________

4. Do Application #2.
5. Refer back to the electric bill in part 1. Ask: "How can we compute the average monthly cost per kilowatt hour of 100 cubic feet of gas?" Elicit: Divide the total bill by the number of KWH of 100 cu. ft. of gas.
6. Do Application #3.
7. Similar problems can be found using water bills.

APPLICATIONS:

1. Refer to 'Your City Electric' bill:
   a) What was the date of the bill?
   b) Verify the usage.
   c) How can we verify the total cost of the bill?
   d) When do you expect the next bill?
2. Refer to the 'Big City Gas Co.' bill:
   a) What is the period of time this bill covers?
   b) Who is the bill made out to?
   c) Fill in the usage to determine the number of cubic feet used.
   d) Calculate the total bill.
   e) When do you expect the next bill?

3. a) Compute the average monthly cost per kilowatt hour in development part 1.
   b) Compute the average monthly cost per 100 cubic feet of gas in development part 3.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) April 30
   b) 41342 - 40520 = 822
   c) Add $73.16 + 2.40 + 5.30
   d) May 31
2. a) February 1 - 28
   b) Bob Jones
   c) 743 - 699 = 44
   d) $8.49 - .54 + 1.15 = $9.10
   e) March 31
3. a) Approximately $.10
   b) Approximately $.21

SUMMARY:

1. What information do we usually find on a utility bill?
2. How do we compute the average monthly cost per KWH of 100-cubic feet of gas?

CONSUMER MATH
MATHEMATICS IN THE HOME
LESSON: 18

AIM: How do we solve problems involving measures of time?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Determine the amount of time elapsed between 2 given times.
2. Determine the time at which a task will be completed given the starting time and the length of the task.
3. Anticipate the cost of telephone calls based on a given cost schedule and duration of call.

MOTIVATION:

John's plane leaves New York at 10:45 A.M. and arrives in Miami at 1:15 P.M. How long is the trip?

DEVELOPMENT:

1. Using the motivation problem, ask: "How can we calculate the elapsed time of a trip if we know the starting and ending times?" Elicit: Subtract the times.

2. Discuss various methods of subtracting:

a)
$$\begin{array}{r} 12{:}00 \\ -\ \underline{10{:}45} \\ 1{:}15 \end{array} + \begin{array}{r} 1{:}15 \\ -\ \underline{12{:}00} \\ \phantom{1{:}15} \end{array} \quad \text{or} \quad \begin{array}{r} 1{:}15 \\ -\ \underline{0{:}00} \\ 1{:}15 \end{array} = 2 \text{ hours } 30 \text{ minutes}$$

b)
$$1{:}15 = \begin{array}{r} 13{:}15 \\ -\ \underline{10{:}45} \\ 2{:}30 \end{array}$$

c) Time from 10:45 to 11:00 is 15 min.
from 11:00 to 1:00 is 2 hours
from 1:00 to 1:15 is 15 min. = 2 hours 30 min.

3. Do Application #1.

4. If the same trip to Florida is planned (see motivation problem) and the trip takes $2\frac{1}{2}$ hours, ask: "At what time will a plane arrive if it leaves New York at 11:20 A.M.?" Elicit: We must add 2 hours 30 minutes to 11:20 to compute the arrival time.

$$\begin{array}{r} 11{:}20 \\ +\ \underline{\ 2{:}30} \\ 13{:}50 \end{array} = 1{:}50 \text{ P.M.}$$

Indicate that if the minutes add up to more than 60 they must be converted to hours and minutes.

5. Do Application #2.

6. The Telephone Co. charges people for calls based upon how long they talk. For example:

First 3 minutes	$.35
Each additional minute	$.10

Ask: "Calculate the cost of a 7 minute call."
Elicit: $.75.

7. Do Application #3.

APPLICATIONS:

1. The following reflects the departing and arrival times for Amtrak from New York to various cities. Calculate the time of travel between cities.

	LEAVE NEW YORK	ARRIVE CITY	TRAVEL TIME
a)	9:00 A.M.	2:00 P.M.	
b)	10:30 A.M.	3:20 P.M.	
c)	11:45 A.M.	4:10 P.M.	
d)	8:30 P.M.	2:15 A.M.	
e)	9:22 P.M.	1:19 A.M.	

2. Barbara starts her 10 kilometer race at 12:48. If she expects to finish in 54 minutes, at what time should she pass the finish line?

3. Compute the cost of a telephone call in each case, based on the following:

FIRST 5 MINUTES	$.40
EACH ADDITIONAL MIN.	$.15

   a) 8 minute call
   b) 10 min call
   c) 4 min call
   d) 20 min call
   e) 1 hour call

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 5 hours
   b) 4 hrs. 50 min.
   c) 4 hours 25 min.
   d) 5 hours 45 min.
   e) 3 hours 57 min.

2. 1:42

3. a) 85¢
   b) $1.15
   c) 40¢
   d) $2.65
   e) $8.65

SUMMARY:

1. Given the starting and arriving time, how do we calculate time elapsed?

2. Given the starting time and elapsed time, how do we calculate the arrival time?

CONSUMER MATHEMATICS

MATHEMATICS IN THE HOME

LESSON: 19

AIM: How do we convert temperatures from one scale to another?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Convert Fahrenheit to Celsius.
2. Convert Celsius to Fahrenheit.

VOCABULARY: Fahrenheit scale, Celsius scale

MOTIVATION:

Would an overcoat be appropriate attire if the temperature is 20 degrees Celsius? Explain.

DEVELOPMENT:

1. Using the motivation problem, students must judge whether 20° Celsius is warm or cold. Review Fahrenheit scale - 32° is the point at which water freezes, 212° is the point at which water boils (turns to steam). Explain that these points were arbitrarily set on the thermometer and referred to as the Fahrenheit scale. (This unit of measure is part of the English system.)
2. Determine that in the metric system of measure, the scale has water freezing at 0° and boiling at 100°. This scale is known as the Celsius scale. Ask: "Is 20° C warm or cold?" Elicit: Warm. Ask: "How warm is it?" Elicit: We would have to convert the Celsius temperature to Fahrenheit in order to tell.
3. Establish the formula for converting Fahrenheit to Celsius: $C = \frac{5}{9}(F-32)$
4. Do Application #1.
5. Ask: "How would we convert Celsius to Fahrenheit?" Elicit: We can substitute into the same formula as in part 3 or develop a formula which directly finds F.

Given $C = \frac{5}{9}(F-32)$, multiply both sides by 9, then

$9C = 5(F-32)$, divide both sides by 3, then

$\frac{9}{5}C = F-32$, then add 32 and

$\frac{9}{5}C+32 = F$

6. Do Application #2.
7. Do Application #3.

APPLICATIONS:

1. Convert the following Fahrenheit temperatures to Celsius:
   a) 41° b) 50° c) 32° d) 77°
2. Convert the following Celsius temperatures to Fahrenheit:
   a) 15° b) 25° c) 0° d) -5°
3. a) Some cars contain thermostats that are set at 180°F to keep the radiator running correctly. Express this temperature in Celsius degrees.
   b) What was the drop in temperature Celsius if the thermometer dropped from 23°F to 14°F?

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 5° b) 10° c) 0° d) 25°
2. a) 59° b) 77° c) 32° d) 23°
3. a) Approximately 82°C.
   b) 5°C Since 23°F is equivalent to -5°C
   and 14°F is equivalent to -10°C.

SUMMARY:

1. How do we convert Fahrenheit temperatures to Celsius?
2. How do we convert Celsius temperatures to Fahrenheit?

CONSUMER MATHEMATICS

MATHEMATICS IN THE HOME

LESSON: 20

AIM: What are the insurance costs of maintaining a house?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Define renter's insurance, homeowners' insurance, co-insurance.
2. Determine insurance policy premiums.
3. Determine insurance company liability based on co-insurance.
4. Determine the average cost per $1000 of insurance.

VOCABULARY: renters' insurance, homeowners' insurance, co-insurance

MOTIVATION:

How do homeowners protect their homes and its contents from losses due to fire?

DEVELOPMENT:

1. Using the motivation problem, elicit the need to purchase insurance. Ask: "What other protection do homeowners buy to protect their homes and its contents?" Elicit: Theft, weather, accidents, smoke, explosion, vandalism, etc.
2. Ask: "Can people who rent apartments or houses purchase insurance as well?" Elicit: Yes, it is called renters' insurance. Discuss the fact that there are many kinds of insurance coverage and the amount of coverage often determines how much a person will receive from the company when a claim is made.
3. Define co-insurance as a clause in an insurance policy which requires that the insured pay a part of the bill (usually 20%). Less than full coverage is provided for

partial loss of a dwelling if the insurance carried is less than the 80% of the replacement cost. For example: A home would cost $50,000 to replace. If a homeowner carries a policy for $30,000, then any damage to the home would be paid on the basis of less than full coverage. If damage during a storm caused $4000 damage, then the company would pay as follows: 80% of $50,000 = $40,000

$$\text{Insurance pays} = \frac{30{,}000}{40{,}000}\ \frac{\text{(amount carried)}}{\text{(80\% of replacement cost)}} \times \begin{matrix}\text{amount}\\ \text{of loss}\end{matrix}$$

$$= \frac{3}{4} \times 4000$$

$$= \$3000$$

4. Do Application #1.

5. Discuss the fact that premiums for this kind of insurance are usually based on each $1000 of coverage. For example: The premium for each $1000 of insurance is $9. Ask: "What is the cost of insurance on the house in part 3 (remember it was insured for $30,000)."
   Elicit: Premium = $9 x 30 = $270.

6. Do Application #2.

APPLICATIONS:

1. Fire destroyed a house having $45,000 worth of coverage. The replacement cost of the home is $80,000. How much will the insurance company pay?

2. Use the premium in development part 5 and find the cost of insurance for a house with coverage for:
   a) $50,000 b) $75,000 c) $89,000

SOLUTIONS TO APPLICATION PROBLEMS:

1. 80% of $80,000 = $64,000

$$\text{Insurance pays} = \frac{\$45{,}000}{\$64{,}000} \times \$45{,}000 = \$31{,}640.63$$

2. a) $450 b) $675 c) $801

SUMMARY:

1. What is renters' insurance? Homeowners' insurance? Co-insurance?
2. How did we determine a company's liability based on co-insurance?
3. How do we determine premiums on home insurance?

CONSUMER MATHEMATICS

TABLES, CHARTS AND GRAPHS

LESSON: 1

AIM: What is meant by statistics? What techniques do we use in collecting data?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Give examples in which analysis of data is used to make decisions:
    - a) budgets
    - b) taxation
    - c) loans
    - d) transportation tables, etc.
2. Define statistics.
3. Identify and examine techniques of collecting, organizing and interpreting data.

VOCABULARY: statistics, data, survey, poll

MOTIVATION:

Show students the results of a survey or poll which appeared in a newpaper or magazine, such as: "65% of the doctors polled recommend Brand X." Ask, "What does this statement mean?" Elicit that in a poll taken 65 out of every 100 doctors asked recommend Brand X.

DEVELOPMENT:

1. Using the motivation define survey or poll.
2. Ask students for other examples of surveys or polls such as elections, advertising.
3. Ask why such polls are used and why they may be necessary.
4. Ask how the collection of data can be displayed. Elicit: tables, charts, graphs.

5. Demonstrate several examples of collected data from newspapers and magazines (i.e. weather statistics).
6. Define statistics as the collection, analysis and interpretation of facts called data.
7. Do Application #1.
8. Distribute a sheet and have students describe how they would complete application #1.
9. Ask, "How do professional pollsters gather their information?" Elicit: mailings, telephone, canvass techniques, random samples.
10. Ask, "What problems do pollsters have in collecting data?" Elicit: size of sample, representative sample, tainted results, misunderstood or ambiguous questions, poorly designed surveys.
11. Do Application #2.
12. Do Application #3.

APPLICATIONS:

1. Set-up a survey data form to indicate how the students in class get to school. When ready a tally should be completed on the blackboard.
2. Set-up and conduct a survey of the top 10 TV programs watched by students in your class(school).
3. The Johnson H.S. Student Organization has a limited amount of space to store candy to sell. Develop a survey data form to determine what kind of candy the school will buy. Then conduct a survey among your friends, family and classmates to collect data using the form.

SOLUTIONS TO APPLICATION PROBLEMS:

1. List the possible methods of getting to school: car, bus, train, bike, skateboard, walk. Then by asking each student tally the results.
2. Students may wish to limit the number of shows before conducting the poll.

3. See #2.

SUMMARY:

1. What is the definition of statistics?
2. What techniques do we use in collecting data?
3. What are some of the difficulties and problems we must consider in developing a poll or survey?
4. Give some examples in which analysis of data is used to make decisions.

CONSUMER MATHEMATICS

TABLES, CHARTS AND GRAPHS

LESSON: 2

AIM: How do we read and interpret statistical information? How do we make decisions based upon information from tables?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Give examples in which presentation of information in tables and charts is useful.
2. Describe ways of presenting statistical information:
   a) tables
   b) charts
   c) graphs
   d) lists
3. Read tables and charts and answer questions related to the information given.
4. Make decisions based on information presented in tables and charts.

VOCABULARY: tables, graphs, charts, lists

MOTIVATION:

Present a table or chart such as the following:

XYZ Soda Shop

Employee	Hourly Wage	Mon	Tue	Wed	Thu	Fri
Sam	$3.50	8	8	---	8	7
Maria	$3.80	8	8	8	8	8
Joseph	$4.00	---	5	8	7	8
Irene	$3.35	9	---	8	5	8

Ask, "What does the data on this table tell us?" Elicit: the title and a listing of the information presented: Employees' names, their hourly wage and how many hours they worked each day. (Note: These charts, etc. can presented on rex-o sheets, photocopies or on an overhead projector.)

DEVELOPMENT:

1. Using the motivation problem as an example, Ask: "What ways can we use to present statistical information?" Elicit: tables, graphs, charts, lists. Show an example of each.
2. Using the motivation problem develop skills in reading statistical information:
   - a) What is the title?
   - b) What do the vertical and/or horizontal scales represent?
   - c) Students should be able to verbalize the information presented in a table: "This table represents the number of hours worked and the hourly wage of each employee of the XYZ Soda Shop."
3. Demonstrate that other questions can be answered using the table. Ask, "How many total hours did each employee work this week?" Elicit: The answer and how it was arrived at. Ask, "How much did each employee earn this week?"
4. As a result of the above demonstrate that as a result of reading and interpreting tables we can make decisions based upon the given information. Ask, "Which employee worked the greatest number of hours during the week?" Ask, "Which employee earned the most money this week?" Ask, "Which employee would the owner want to work overtime in order to save money?"
5. Do Application #1.
6. Do Application #2.

APPLICATIONS:

1. Joanne Snyder's Monthly Budget (In $)

	Jan.	Feb.	March	April
Food	16	15	17	18
Car	19	20	20	21
Entertainment	10	10	11	10
Clothes	10	5	8	9
Gifts	5	8	5	5
Misc.	8	7	8	8

a) What was the total amount Joanne budgeted for each month?

b) In which month did she budget the most money?

c) Is Joanne's budget increasing or decreasing on the average?

d) What was Joanne's average car bills for the 4 months?

e) Predict a budget for May.

2. Mark Foley's Book Sales January 1986

	Week 1	Week 2	Week 3	Week 4
Encylop.	1	0	0	1
Cookbook	4	1	3	0
Travel	0	2	1	1
Fiction	4	5	8	2
How-to	3	1	1	2

a) In which week did Mark sell the most books?

b) What was the total number of books sold by Mark in Jan.?

c) If cookbooks sell for $5 each, what was the total amount collected for the sale of cookbooks?

d) If Mark's average profit was $1.50 per book, how much profit did Mark make?

e) If Mark had to give up the sale of one type of book, which one would he give up? Why?

f) Travel books cost Mark $3 and he sells them for $4.25. How much profit did Mark make on the sale of travel books in January?

SOLUTIONS TO APPLICATIONS PROBLEMS:

1. a) Jan. $68
   Feb. $65
   Mar. $69
   Apr. $71
   b) April
   c) Increasing
   d) $20
   e) Answers may vary slightly. Students should be able to justify their answers.

2. a) Week 3
   b) 40
   c) $40
   d) 40 x $1.50 = $60
   e) Encylopedias. Sells so few.
   f) $1.25 x 4 = $5

SUMMARY:

1. In what ways is statistical information presented?
2. What do we look for in reading tables to help us determine what information the table gives us?
3. How do we make decisions based upon information from tables?

CONSUMER MATHEMATICS
TABLES, CHARTS AND GRAPHS
LESSON: 3

AIM: How do we construct statistical tables?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Gather data on a specific topic, analyze data and determine how to present the data.
2. Develop the method of tallying.
3. Tally, organize and present the data in a table or chart.

VOCABULARY: tally, statistical table

MOTIVATION:

Ms. Smith gave a test in her math class. The principal asked her for a breakdown of the results. Ask, "In what form should Ms. Smith present the data to the principal?" Elicit: Perhaps the best method would be to group the results and give the principal the number of students who scored a particular grade.

DEVELOPMENT:

1. Using the motivation example, Ask: "How will Ms. Smith organize her data?" Elicit: setting up a table to tally the scores on the test." (See application #1.)
2. Using Application #1 set up a table as follows:

Scores on Ms. Smith's Last Test

Score	Tally	Number of Students
100	////	4
90	////	4
80	~~////~~ ///	8
70	////	4
60	//	2
50	/	1

3. Describe the 'soldiers' in the tally column as tallying. Ask students for other examples where they might use this method of tallying. Elicit: class elections, taking a poll, keeping score in a game.
4. Present application #2 and have students construct a table of the data. Remind students that they need a title for the table and the columns need headings.
5. Discuss the fact that some tables should be ordered (i.e. scores are listed from highest to lowest) while others need not be ordered (i.e. favorite TV shows or favorite color.)

APPLICATIONS:

1. Ms. Smith's test grades on the last test: 90, 70, 80, 100, 80, 80, 70, 80, 90, 60, 80, 50, 100, 90, 70, 80, 60, 90, 80, 80, 70, 100, 100.
2. Marjorie Paul took a survey in her class to tally the favorite color of her classmates. The result were as follows:
   B = Blue, R = Red, G = Green, Y = Yellow
   B,Y,G,G,R,B,G,B,R,Y,B,R,R,G,B,B,B,Y,B,R
   Using these results set up a table of the data.

SOLUTIONS TO APPLICATIONS PROBLEMS:

1. See Development #2.

2. Class Survey of Favorite Color

Color	Tally	Number
Blue	𝍸 ///	8
Red	𝍸	5
Green	////	4
Yellow	///	3

SUMMARY:

1. What are the essential parts of a statistical table?
2. What is meant by tallying?
3. What are the steps used in constructing a statistical table?

CONSUMER MATHEMATICS
TABLES, CHARTS AND GRAPHS
LESSON: 4

AIM: How do we describe data?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Calculate and interpret the mean, median and mode.
2. Solve verbal problems involving mean, median and mode.

VOCABULARY: mean, average, median, mode, bimodal

MOTIVATION:

Ask, "How do you find the average of your test scores in this class?" Elicit: adding the scores of all your tests and dividing the sum by the total number of scores added.

DEVELOPMENT:

1. Demonstrate the motivation question by using 80, 90, 85, 75, 80 and calculate the average to be 82. Define mean as a statistical measure we commonly call the average.
2. Do Application #1.
3. Refer to the last lesson and Ms. Smith's test grades. Have the students calculate the average. Discuss the use of calculators as a means of simplifying the problem with a great deal of data. (Remind students that calculating the mean may result in fractional answers. We often round-off to approximate the results.)
4. Discuss the fact that finding the mean can often be misleading, such as in the following problem:

   Jason's test scores are 100, 90, 90, 100, 0.

   Calculating the average would yield 76 which is really not representative of his grades. Elicit use of median as another measure in statistics which may be more meaningful in describing data. Define median as the score that lies in the middle (halfway) when the data is placed in numerical order.

5. Calculate the median in 4. above (90) and then demonstrate finding the middle value in the table of Ms. Smith's test grades from the last lesson. Ask, "How can we look at the table and calculate the median?" Elicit: The median is the 12th score in a list of 23. Therefore from the top entry begin counting 4 + 4 = 8, 8 + 8 = 16. The median must lie in the interval where the 12th score would appear and that is represented by the score 80. The median is 80.
6. Do Application #2. In the last problem there is no middle value. Demonstrate that the median would then lie halfway between the two middle values (the average of these two scores.)
7. Refer to the table constructed in the last lesson describing the favorite color of the class. Ask, "What is the most popular color?" Elicit: blue. In statistics the item that appears the most in the data is referred to as the 'mode'. Define mode as the item that appears the greatest number of times (most frequent).
8. Do Application #3. In part(d), there are two numbers which appear twice. Describe bimodal as a set of data having two modes. In part(e), there is no mode.

APPLICATIONS:

1. Find the mean for each set of numbers:
    a) 8, 9, 7, 2, 3, 7, 6
    b) \$9, \$7, \$13, \$5, \$3, \$11
    c) 47, 21, 89, 12, 21
    d) 116, 132, 116, 104, 132, 126
    e) 10.3, 10.1, 10.2, 10.6, 10.3
    f) The girls basketball team played seven games this season. Their scores were 56, 59, 61, 56, 64, 43, and 81.
2. Find the median for each set of numbers:
    a) 15°, 22°, 23°, 16°, 22°, 12°, 16°
    b) 47, 21, 89, 12, 21
    c) 10.3', 10.1', 10.2', 10.6', 10.3'

   d) 6, 8, 7, 4, 9, 8, 7, 5, 3, 1, 2
   e) 8, 9, 7, 2, 3, 1

3. Find the mode for each set of numbers:
   a) 8, 9, 7, 2, 3, 7, 6
   b) 47, 21, 89, 12, 21
   c) 73°, 87°, 78°, 69°, 73°, 58°
   d) 309, 305, 309, 301, 301
   e) $9, $7, $13, $5, $3, $11
   f) 2, 2, 2, 5, 5, 5, 5

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 6
   b) $8
   c) 38
   d) 121
   e) 10.3
   f) 60

2. a) 16°
   b) 21
   c) 10.3'
   d) 6
   e) 5

3. a) 7
   b) 21
   c) 73°
   d) 301 and 309
   e) no mode
   f) 5

SUMMARY:

1. What are the ways we describe data?

2. How do we find the mean, median and mode using a set of data?

CONSUMER MATHEMATICS

TABLES, CHARTS AND GRAPHS

LESSON: 5

AIM: How do we construct frequency tables?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Define frequency.
2. Use their knowledge of tallying to organize a frequency table with appropriate intervals.
3. Use a frequency table to determine the interval containing the mean.
4. Construct a frequency table from a group of unorganized data.

VOCABULARY: frequency, frequency table, interval

MOTIVATION:

Refer to Ms. Smith's test grades from the lesson on constructing statistical tables and then introduce the following problem:

The RCT results in Mr. Moro's class were as follows: 64, 87, 83, 74, 75, 60, 65, 91, 95, 86, 85, 72, 78, 70, 91, 85, 64, 71, 73, and 80. Prepare a table of the results of Mr. Moro's RCT test results.

Ask, "How does tallying this data present problems that did not exist when we set up the table for Ms. Smith's results?" Elicit: The scores on Mr. Moro's RCT tests are scattered and we would have to list every score before tallying. Ask, "How might we group the data to make it easier to tally?" Elicit: Use intervals of grades rather than every grade.

DEVELOPMENT:

1. Ask for suggestions on how to establish intervals. Then set up the table. (Note: There may be other reasonable suggestions for the intervals but in this case grades in the 90's, 80's, etc. seem more reasonable.)

RCT RESULTS FOR MR. MORO'S CLASS

TEST SCORE INTERVAL	TALLY	NUMBER
91-100	///	3
81-90	~~////~~	5
71-80	~~////~~ //	7
65-70	//	2
Below 65	///	3

2. Explain that we sometimes call the number of scores in a particular interval, the frequency. Define frequency as the number of times an event occurs. Note that the statistical tables that we have been constructing are also referred to as frequency tables.

3. Do Application #1.

4. Explain that intervals may vary slightly and that they should be equal and spread out to cover the highest and the lowest values. Ask, "In what interval does the median lie?" Elicit: The median lies between the 10th and 11th scores. Therefore counting 7 + 4 = 11, the median must lie in the 32-34 interval.

5. Do Application #2.

6. In Application #2 ask: "In what interval does the median lie?" Elicit: 80-89.

APPLICATIONS:

1. The points scored by Jonathan Nathan in twenty basketball games were: 35, 33, 27, 35, 37, 32, 29, 35, 32, 35, 23, 32, 29, 37, 26, 35, 29, 31, 28, 30. Set up and complete a frequency table.

2. The test scores of 15 students were: 86, 57, 69, 82, 91, 87, 75, 84, 68, 65, 91, 88, 81, 62, 72. Set up and complete a frequency table.

SOLUTIONS TO APPLICATION PROBLEMS:

1. JONATHAN NATHAN'S BASKETBALL POINTS

INTERVAL	TALLY	FREQUENCY
35-37	𝍸 //	7
32-34	////	4
29-31	𝍸	5
26-28	///	3
23-25	/	1

2. SCORES ON A TEST

INTERVAL	TALLY	FREQUENCY
90-99	//	2
80-89	𝍸 /	6
70-79	//	2
60-69	////	4
50-59	/	1

SUMMARY:

1. What is meant by frequency?
2. What is a frequency table?
3. Why do we use intervals in setting up a frequency table?
4. How can we find where the median of data lies from observing a frequency table?

CONSUMER MATHEMATICS
TABLES, CHARTS AND GRAPHS
LESSON: 6

AIM: How do we construct cumulative frequency tables?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Define cumulative frequency.
2. Complete a cumulative frequency table given a frequency table.
3. Construct a cumulative frequency table from a group of unorganized data.

VOCABULARY: cumulative, cumulative frequency

MOTIVATION:

Have students complete the following table:

The ages of 15 students attending a dance committee meeting are: 17, 14, 16, 18, 17, 19, 15, 15, 16, 13, 17, 13, 18, 16, 17. Complete the following table.

Ages	Frequency
13	
14	
15	
16	
17	
18	
19	

Ask, "How many students attending the meeting are under 16 years of age?" Elicit: 5.
Ask, "How did you arrive at the answer?" Elicit: Adding the number of students 13, 14 and 15 years of age.
Demonstrate that if we accumulated the totals as we increased from 13 to 19, we would have a running total all the time.

DEVELOPMENT:

1. Using the motivation problem, define cumulative frequency as frequency which combines the sum of the previous frequencies.

2. Complete the motivation problem by adding a cumulative frequency column.

Ages	Frequency	Cumulative Frequency
13	2	
14	1	
15	2	
16	3	
17	4	
18	2	
19	1	

3. Do Application #1.

4. Explain that in developing a cumulative frequency table from a group of unorganized data students should:
   a) Decide on the intervals to be used.
   b) Order the intervals from smallest to highest.
   c) Tally the scores.
   d) List the frequencies.
   e) List the cumulative frequencies from lowest to highest.

5. Do Application #2.

APPLICATIONS:

1. The following table represents the number of books 100 students at Beach H.S. read this year:

Interval	Frequency	Cumulative Frequency
0-2	27	
3-5	12	
6-8	32	
9-11	18	
Over 11	11	

   a) Complete the cumulative frequency column.
   b) How many students read 3-5 books?
   c) How many students read at least 5 books?
   d) How many students read at most 11 books?
   e) How many students read more than 2 books but fewer than 9 books?

2. Last year Mr. Pearl's golf scores were as follows: 83, 85, 95, 90, 72, 104, 92, 92, 86, 93, 91, 95, 97, 101, 95, 99, 86, 95, 90, 91.
   a) Use intervals of 70-75, 76-81, 82-87, 88-93, 94-99, 100-104 and construct a cumulative frequency table.
   b) How many times did Mr. Pearl score below 94?
   c) How many times did he score above 87?
   d) How many times did he score at least 88?
   e) In what interval is Mr. Pearl most likely to score?

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 27, 39, 71, 89, 100
   b) 12
   c) 39
   d) 89
   e) 71 - 27 = 44

2. a)

Interval	Frequency		Cumulative Frequency
70-75	/	1	1
76-81		0	1
82-87	////	4	5
88-93	𝍸 //	7	12
94-99	𝍸 /	6	18
100-105	//	2	20

   b) 12
   c) 20 - 5 = 15
   d) 20 - 5 = 15
   e) 88 - 93

SUMMARY:

1. What is meant by cumulative frequency?
2. What are the steps in constructing a cumulative frequency table?

CONSUMER MATHEMATICS

TABLES, CHARTS AND GRAPHS

LESSON: 7

AIM: How do we read and interpret pictographs?

PERFORMANCE OBJECTIVES: The student will be able to...

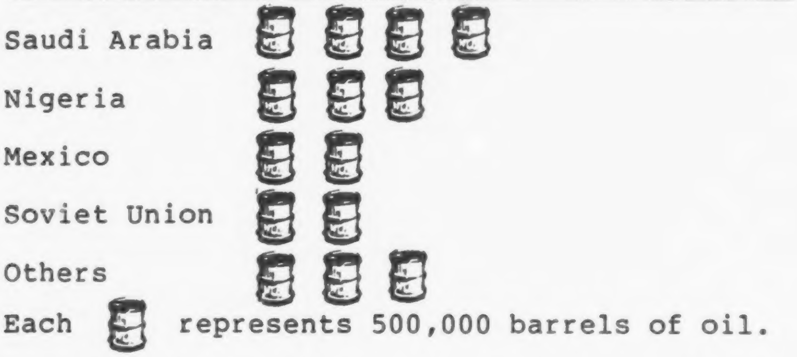
1. Read the scale on a pictograph.
2. Calculate the numerical quantities of the symbols used in the pictograph.
3. Use a pictograph to answer questions, solve problems or make decisions based upon the data presented.

VOCABULARY: pictograph

MOTIVATION:

1. Find a pictograph used in a newspaper or magazine such as:

OIL PRODUCING COUNTRIES DAILY PRODUCTION



Ask, "What does this graph tell us?" Elicit: The number of barrels of oil produced by certain countries daily. Ask, "What does each symbol represent?" Elicit: 500,000 barrels of oil. Ask, "Can we determine the number of barrels of oil produced by Mexico?" Elicit: Yes, 1,000,000 barrels a day.

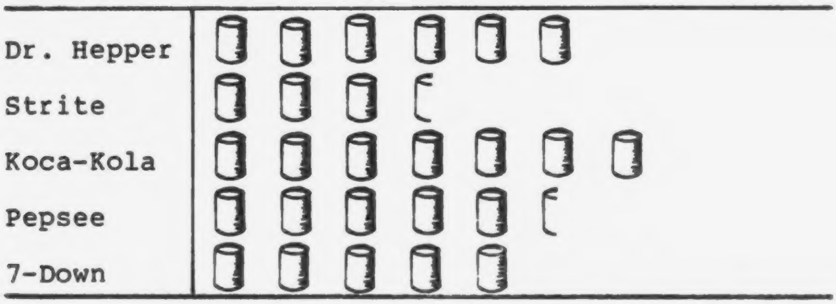
DEVELOPMENT:

1. Show several other examples of pictographs. Demonstrate why they are used: easy to read, visually attractive,

simple to prepare, often the symbols represent the subject of the graph.

2. Present another pictograph similar to the following:

SODA SALES - ABC BEVERAGE
FOR APRIL



Note: Each symbol represents 10 cases of Soda.

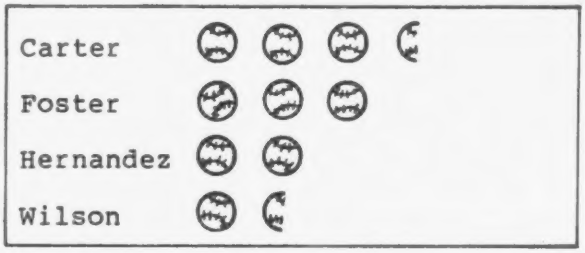
Ask, "Which soda had the best sales in April?" Elicit: Koca-Kola. Ask, "How many cases of Koca-Kola were sold?" Elicit: 70. Ask, "What was the total number of cases sold?" Elicit: 27.

3. Do Application #1.

4. Do Application #2.

APPLICATIONS:

1. HOMERUNS HIT BY THE METS



Each symbol = 10 homeruns hit.

a) How many homeruns did Wilson hit?

b) Who hit the most homeruns?

c) How many more homeruns did Foster hit than Hernandez?

e) If we added Strawberry to this graph, how many symbols would we use to represent his homerun total of 25 homeruns?

2.

AMOUNT SPENT ON TOYS FOR CHRISTMAS

Board Games	\$ \$ \$
Video Games	\$ \$ \$ \$
Electronics	\$ \$
Card Games	\$
Guns	\$
Others	\$ \$

Each \$ = \$1 million

Ask appropriate questions similar to those in Application #1.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 15
   b) Carter
   c) 10
   d) 100
   e) $2\frac{1}{2}$

SUMMARY:

1. Why do people use pictographs?

2. How do we calculate each entry on a pictograph?

CONSUMER MATHEMATICS

TABLES, CHARTS AND GRAPHS

LESSON: 8

AIM: How do we construct pictographs?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Determine what scale to use in constructing a pictograph.
2. Determine a symbol to use in a pictograph and the numerical value of each symbol.
3. Construct a pictograph from a group of statistical data.

VOCABULARY: scale

MOTIVATION:

The City High School Student Organization wished to show the school the results of their recent campaign to raise canned food for the needy. Using a pictograph, how could they show the following results?

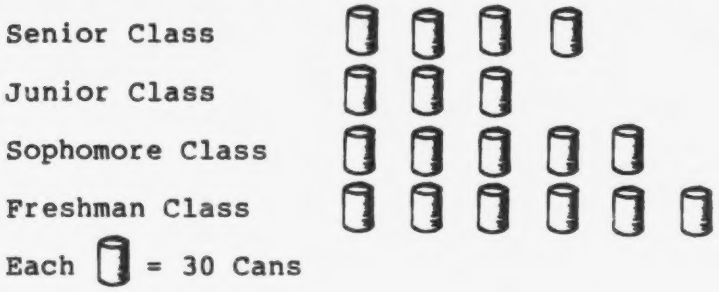
Senior Class - 120 cans collected
Junior Class - 90 cans collected
Sophomore Class - 150 cans collected
Freshman Class - 180 cans collected.

DEVELOPMENT:

1. Using the motivation problem ask: "What information do we wish to represent?" Elicit: The number of cans of food collected by each grade. Ask, "What symbol could we use to represent this information?" Elicit: A can. Ask, "What items would we need to represent on the scale?" Elicit: The four classes. Ask, "How much should each symbol represent?" Elicit: A convenient quantity like 30 cans in this case. Ask, "List the number of symbols needed for each grade, using 30 cans for the symbols?"
   "Elicit: Senior - 4, Junior - 3, Sophomore - 5, Freshman - 6.

2. Carefully construct the following pictograph from the information in part 1.

NUMBER OF CANS OF FOOD COLLECTED AT CITY H.S.



3. Do Application #1.

4. Do Application #2 (note that approximation is often used since exact numbers are often hard to represent in graphs).

5. Develop the following suggestions for making a pictograph:
   a) List the required information.
   b) Round off numbers, if necessary.
   c) Select a symbol and indicate what it represents.
   d) Indicate the number of symbols needed for each entry.
   e) Give a title to the graph.

APPLICATIONS:

1. The following represents the number of points scored in the playoffs by the Johnson H.S. basketball team:

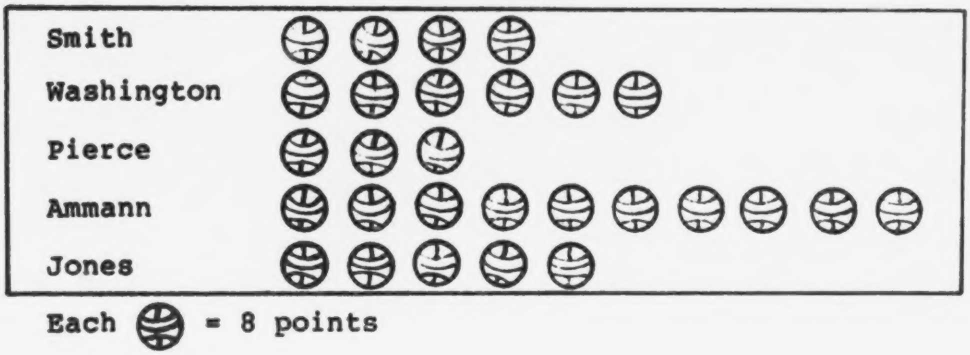
   Smith -32, Washington - 48, Pierce - 24, Ammann - 80, and Jones -40. Construct a pictograph to represent the data.

2. Construct a pictograph of the following:
   The number of cars produced in one year in the United States by the three largest auto companies was:

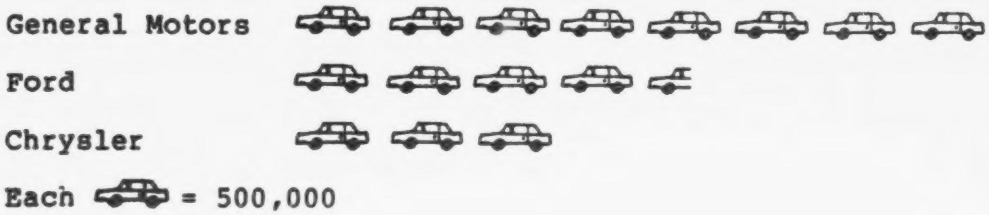
   General Motors - 3,989,000
   Ford - 2,250,000
   Chrysler - 1,400,000

SOLUTIONS TO APPLICATION PROBLEMS:

1. JOHNSON H.S. PLAYOFF POINTS IN BASKETBALL



2. YEARLY CAR PRODUCTION IN U.S.



SUMMARY:

1. What are the steps we follow in constructing a pictograph? (See Development part 5.)

CONSUMER MATHEMATICS
TABLES, CHARTS AND GRAPHS
LESSON: 9

AIM: How do we read and interpret bar graphs?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify bar graphs as a type of graph which shows comparisons.
2. Calculate the numerical quantities of the bars in a bar graph.
3. Use a bar graph to answer questions, solve problems or make decisions based upon the data presented.

VOCABULARY: comparison, bar graph

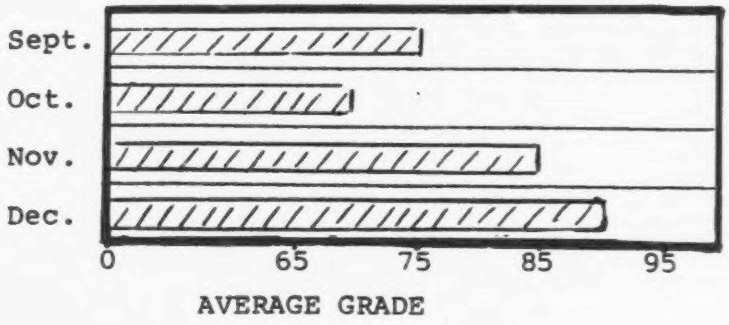
MOTIVATION:

Mr. Rodriquez wished to compare the average grades of his Consumer Mathematics class over the first few months of the term, so he decided to represent the grades in a graph. State: "When one wishes to show comparisons of numerical facts, we use a bar graph."

DEVELOPMENT:

1. Show Mr. Rodriquez' Consumer Mathematics class average grades for the first four months of the term:

MR. RODRIQUEZ' CONSUMER MATH
CLASS AVERAGE GRADES



2. Ask:
   - a) What is the title of the graph?
   - b) What does the vertical scale represent?
     Elicit: Months.
   - c) What does the horizontal scale represent?
     Elicit: Average grades.
   - d) What was the average grade for each month?
     Elicit: Sept. - 75, Oct. - 70, Nov. - 85, Dec. -90.

3. Establish that the numerical scales always begin at 0.

4. Establish the comparison aspect of a bar graph.
   Ask:
   - a) In which month did the class have the highest average? Elicit: Dec.
     Lowest average? Elicit: Oct.
   - b) In which month was there the greatest increase?
     Elicit: Nov.
   - c) Was the average grade generally increasing or decreasing over the four months?
     Elicit: Increasing.

5. Demonstrate that some bar graphs are vertical while others are horizontal and often several sets of comparisons are established in a single graph resulting in a compound bar graph. (See Application #3.)

6. Do Application #1.

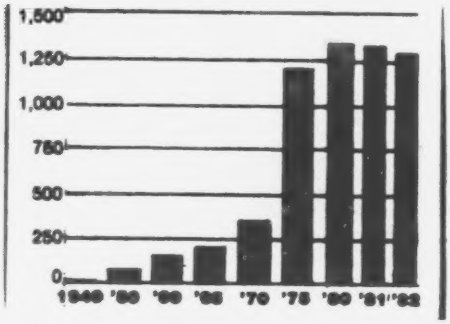
7. Do Application #2.

8. Do Application #3.

APPLICATIONS:

1. Given the following bar graph:

AUTOMOBILE PRODUCTION - U.S.S.R.
(in thousands)



Ask:

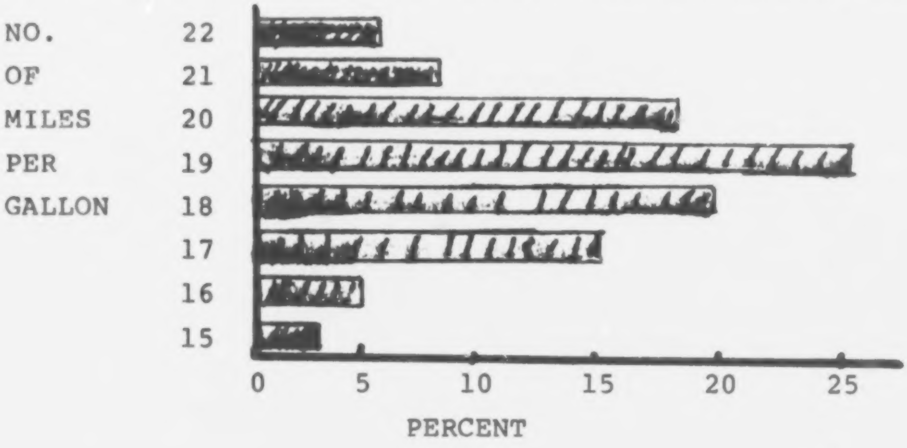
a) "In which year was automobile production in the U.S.S.R. the greatest?"

b) "How many thousands of automobiles were produced in the U.S.S.R. in 1960?"

c) "How many more automobiles were produced in the U.S.S.R. in 1975 than in 1965?"

d) "What might account for the low production of automobiles in the 1940-1960 years?"

2. MILES PER GALLON REPORTED BY 1000 NEW AUTOMOBILE OWNERS

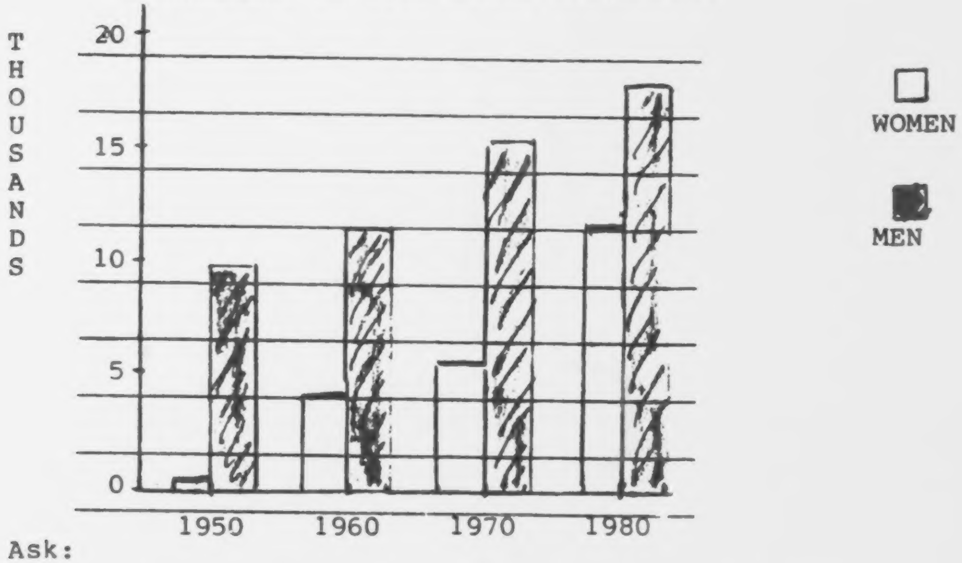


a) What percent of the owners reported mileage of 19 mpg?

b) How many owners reported 20 mpg?

c) How many owners reported at least 20 mpg?

3. ENROLLMENT IN CITY STATE UNIVERSITY



Ask:

a) How many women were enrolled in City State University in 1960? 1980?

b) How many more men than women were enrolled in 1960?

c) What percent increase was there in women enrollment between 1960 and 1970?

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 1980
   b) Approximately 150,000
   c) 1,200,000 - 200,000 = 1,000,000
   d) war years, poor production, lack of need

2. a) 25%
   b) 18% of 1000 = 180
   c) 18 + 8 + 6 = 32, 32% of 1000 = 320

3. a) 1960 - 4000

1980 - 12,000

b) 12,000 - 4000 = 8000

c) 1970 = 5000

- 1960 = 4000

1000 increase

$\frac{1000}{5000} = 20\%$

SUMMARY:

1. Why do we use bar graphs?
2. How do we calculate the numerical quantity of each bar in the graph?

CONSUMER MATHEMATICS

TABLES, CHARTS AND GRAPHS

LESSON: 10

AIM: How do we construct bar graphs?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Determine the scales and intervals to use in constructing a bar graph.
2. Construct a bar graph from statistical data.

MOTIVATION:

Edythe had a 10 question test each day this week. At the end of the week she wished to make a graph of the number of correct answers on each test. Ask, "What type of graph should she make if she wishes to use the graph to compare her daily results?" Elicit: A bar graph which is used to show comparisons.

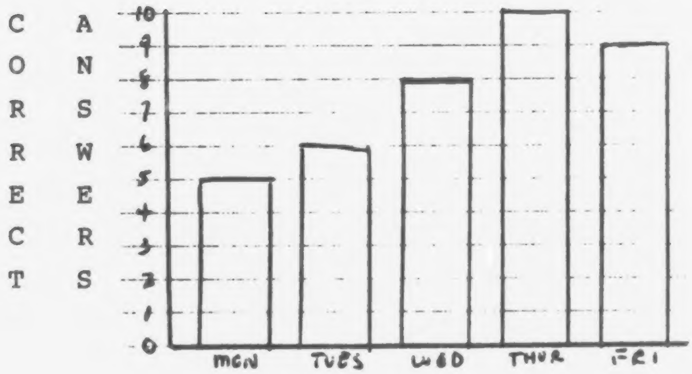
DEVELOPMENT:

1. Ask, "What information does Edythe need to construct her graph?" Elicit: The number of correct answers on each test. Ask, "What should she use for each scale?" Elicit: The days of the week and the correct number of answers (0 - 10).
2. Demonstrate that using graph paper can often make the construction of certain graphs much easier. Students should also list the items to be graphed separately. For example, suppose the scores on Edythe's tests were 5, 6, 8, 10, 9 (Monday - Friday), it is a good idea to write this information on a piece of paper before graphing.
3. Ask, "What is the title of the graph?" Elicit: Edythe's Daily Test Scores. Ask, "Shall we make a horizontal or vertical bar graph?" Elicit: Either one but that decision will change the labels of the vertical and horizontal scales. (In this case we will construct a

vertical bar graph thereby making the vertical scale the number of correct answers and the horizontal scale the days of the week. Remind students that the numerical scale begins at 0.)

4. Build the following bar graph:

EDYTHE'S DAILY TEST SCORES



5. Do Application #1.
6. Do Application #2. Establish the need to round off numerical data in some cases.
7. Develop the following suggestions for constructing a bar graph:
   a) Obtain the required information.
   b) Round off, if necessary.
   c) Decide whether to make a vertical or horizontal graph.
   d) Find a suitable scale.
   e) Start at 0 and mark off this scale on graph paper.
   f) Draw the bars.
   g) Decide on a title.

APPLICATIONS:

1. Make a bar graph given the hourly rates of pay of handymen in:

   Atlanta - $7.50
   Boston - 9.00
   Topeka - 6.50
   Columbus - $9.50
   St. Louis - 7.50

2. Listed are the heights of several buildings. Make a bar graph to compare the heights of these buildings.

   Empire States - 1250 ft.
   Wall Tower - 950 ft.
   Woolworth - 792 ft.
   Chrysler - 1046 ft.

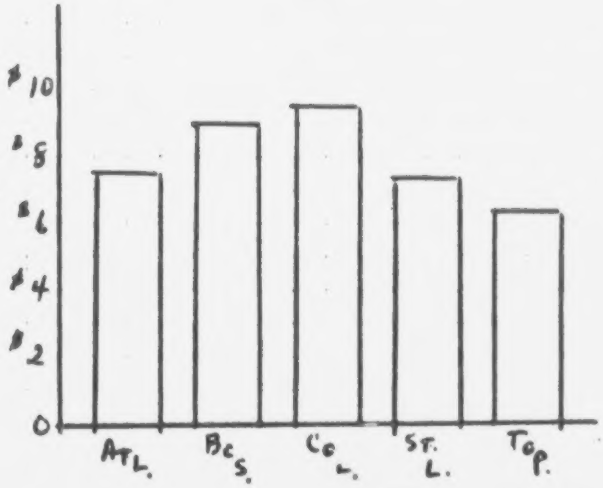
3. Listed below are the number of boys and girls in each of five classes in your school. Make a compound bar graph showing this information.

CLASS	BOYS	GIRLS
10-1	20	15
10-2	10	25
10-3	15	15
10-4	25	5
10-5	15	10

SOLUTIONS TO APPLICATION PROBLEMS:

1.

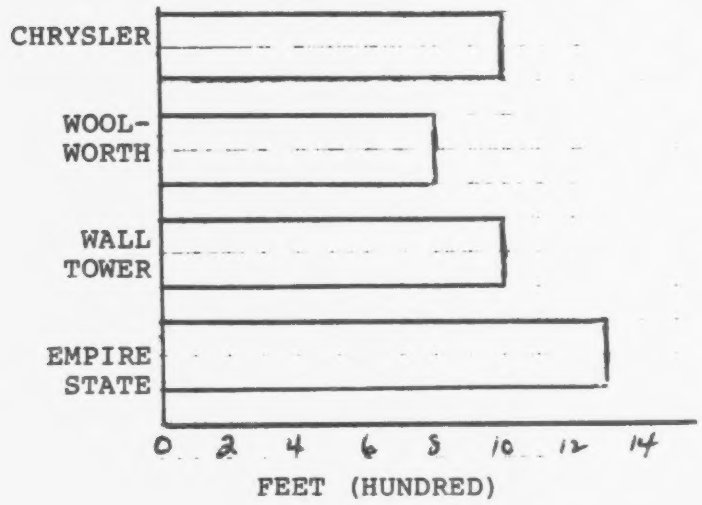
HOURLY RATES OF HANDYMEN



2. Round off to the nearest 100 ft.

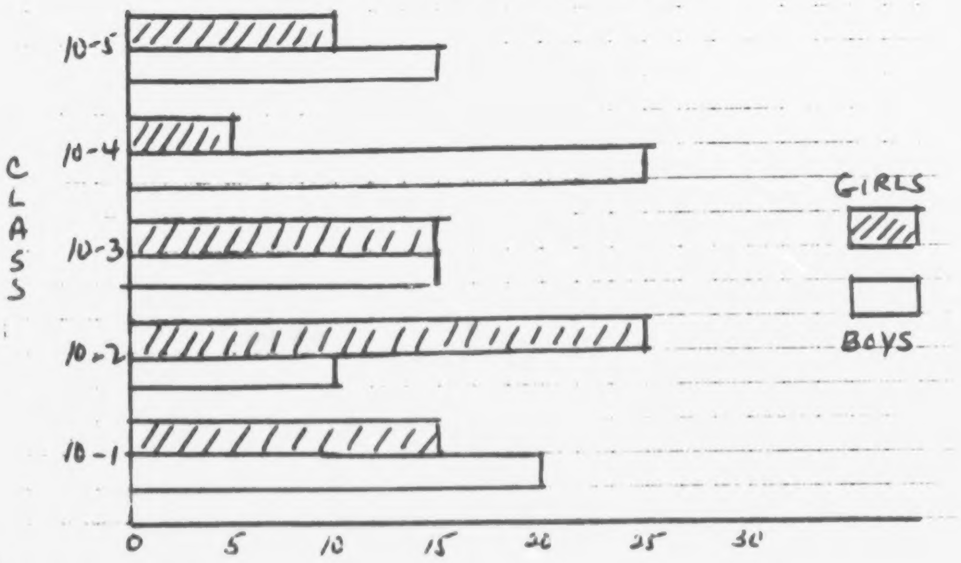
Empire State	1300 ft.	Wall	100 ft.
Woolworth	800 ft.	Chrysler	1000 ft.

HEIGHTS OF BUILDINGS



3.

BOYS AND GIRLS IN 5 CLASSES



SUMMARY:

1. What are the steps in constructing a bar graph?
2. How are the vertical and horizontal scales chosen and named?

CONSUMER MATHEMATICS

TABLES, CHARTS AND GRAPHS

LESSON: 11

AIM: What is a frequency histogram?
How do we construct a frequency histogram?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Construct a frequency histogram with appropriate intervals.

VOCABULARY: histogram

MOTIVATION:

For a class assignment, students bought 20 boxes of candy and counted the number of candies in each box. Their findings were as follows: 20, 17, 18, 17, 18, 20, 19, 18, 18, 17, 19, 18, 18, 18, 17, 18, 15, 20, 20, 17. Tally their results using a frequency table.

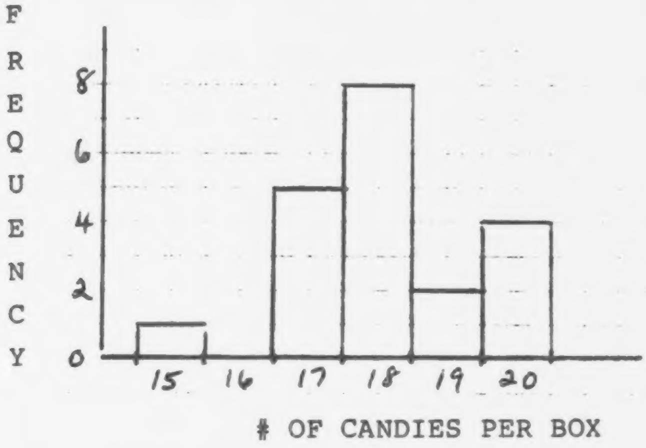
DEVELOPMENT:

1. Have student complete the motivation problem.

Number of Candies Per Box	Tally	Frequency
15	/	1
16		0
17	卌	5
18	卌 ///	8
19	//	2
20	////	4

2. Ask, "How could the class visually represent their findings in order to compare the results of the project?"
   Elicit: A bar graph.
   Develop a histogram as a drawing that helps visualize information presented in a frequency table. Review steps in preparing graphs, especially bar graphs, from a previous lesson.

3. Set up a histogram of the frequency table in part 1.



Ask, "What would we use for the vertical scale? The horizontal scale?" Elicit: Frequency and the number of candies per box. Note that the frequency will always be on the vertical scale and the bars will not be separated by gaps.

4. Note how graphic the histogram is and the information that can be gathered and studied immediately.
5. Do Application #1.
6. Do Application #2.
7. Review the steps in constructing a frequency histogram.
   a) If necessary, construct a table in which data are grouped in intervals of equal length.
   b) Tally your data.
   c) Show the intervals on the horizontal scale marked off in units of equal length and label the scale.
   d) Show the frequencies on the vertical scale marked off in convenient values beginning with 0.
   e) Draw your bars, but do not leave gaps between them.
   f) Give the histogram a title.
8. Do Application #3.

APPLICATIONS:

1. A class record showed the following number of misspelled words in each of 25 essays. Construct a frequency histogram based upon the data.

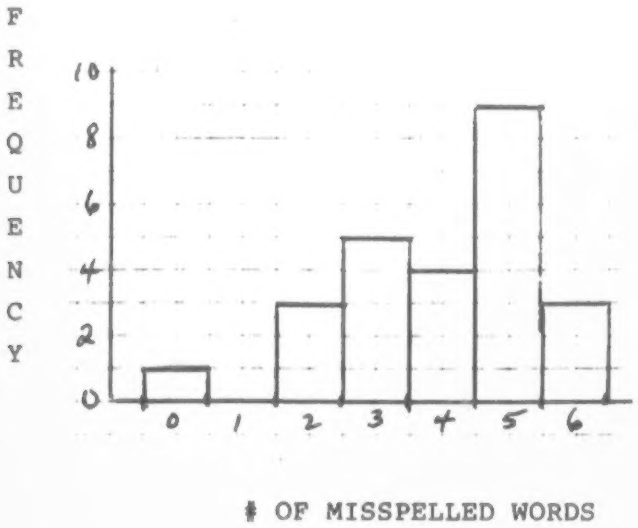
Misspelled Words	Frequency
0	1
1	0
2	3
3	5
4	4
5	9
6	3

2. The weight of 18 students in a class are 64, 56, 60, 66, 72, 48, 66, 58, 60, 50, 68, 72, 68, 62, 72, 58, 68, 60. Construct a frequency histogram based on this data (use the following intervals: 45 - 49, 50 - 54, ..., 70 -74).

3. As a result of constructing a histogram, students might be asked questions based on the histogram. For example, Ask: "What percent of the students weigh between 60 and 64 pounds inclusive?"

SOLUTIONS TO APPLICATION PROBLEMS:

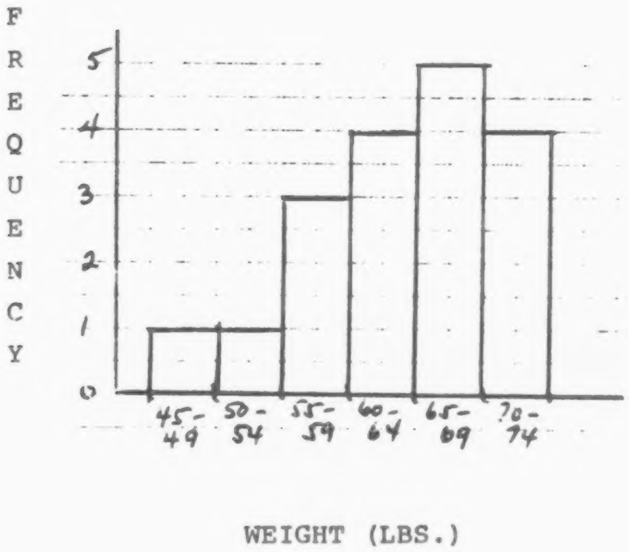
1. NUMBER OF MISSPELLED WORDS



2.

Interval	Tally	Frequency
45 - 49	/	1
50 - 54	/	1
55 - 59	///	3
60 - 64	////	4
65 - 69	𝍸	5
70 - 74	////	4

WEIGHTS OF STUDENTS IN CLASS



3. 4 students weigh 60 - 64.
   18 total students.

$\frac{4}{18}$

```
      .222
   18)4.000
      3 6
       40
       36
        40
```

Approximately 22%

SUMMARY:

1. What is a frequency histogram?
2. Why do we use a frequency histogram?
3. What are the steps used in constructing a frequency histogram?

LESSON: 12

AIM: What is a cumulative frequency histogram?
How do we construct a cumulative frequency histogram?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Construct a cumulative frequency histogram with appropriate intervals.

VOCABULARY: cumulative frequency histogram

MOTIVATION:

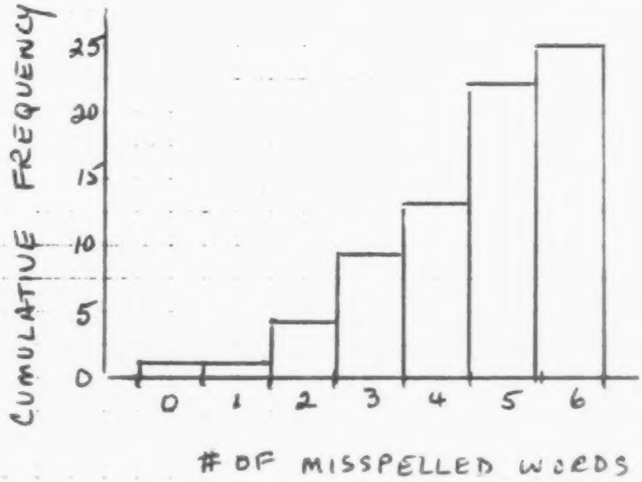
Refer to the previous lesson's Application #1 and have the students complete a cumulative frequency table. Review cumulative frequency tables from a previous lesson and discuss why we construct them and how we use them to interpret information and answer questions (one suggestion would be to give a cumulative frequency table question in the previous night's homework and use it as a motivation for this lesson).

DEVELOPMENT:

1. Establish that we construct frequency histograms to graphically represent the frequencies in a table; we can do that same thing to graphically represent the sum of the frequencies by constructing a cumulative frequency histogram.
2. Complete the motivation problem. Review the steps in constructing a cumulative frequency table.

Misspelled Words	Frequency	Cumulative Frequency
0	1	1
1	0	1
2	3	4
3	5	9
4	4	13
5	9	22
6	3	25

3. Construct a cumulative frequency of the data:



Note that the same steps are used in constructing a cumulative frequency histogram as in a frequency histogram. The only difference is that we are accumulating (cumulative) the frequencies as we go from the lowest interval to the highest interval.

4. Do Application #1.
5. Students should be directed through appropriate questions to note the following:
   a) The intervals must be arranged from lowest to highest.

b) The bars grow taller and the last bar must represent the total of the frequencies.

6. Do Application #2.

7. Review the steps in constructing a cumulative frequency histogram. (Review previous lesson as well.)

APPLICATIONS:

1. The following table shows the distribution of scores of 30 students on a test.

Scores	Frequency	Cumulative Frequency
41 - 50	1	
51 - 60	1	
61 - 70	6	
71 - 80	8	
81 - 90	11	
91 - 100	3	

a) Complete the cumulative frequency column.

b) Construct a cumulative frequency histogram of the data.

2. On a test, 15 students received the following grades: 17, 14, 16, 18, 17, 19, 15, 15, 16, 13, 17, 12, 18, 16, 17.

a) Construct a cumulative frequency table of the data.

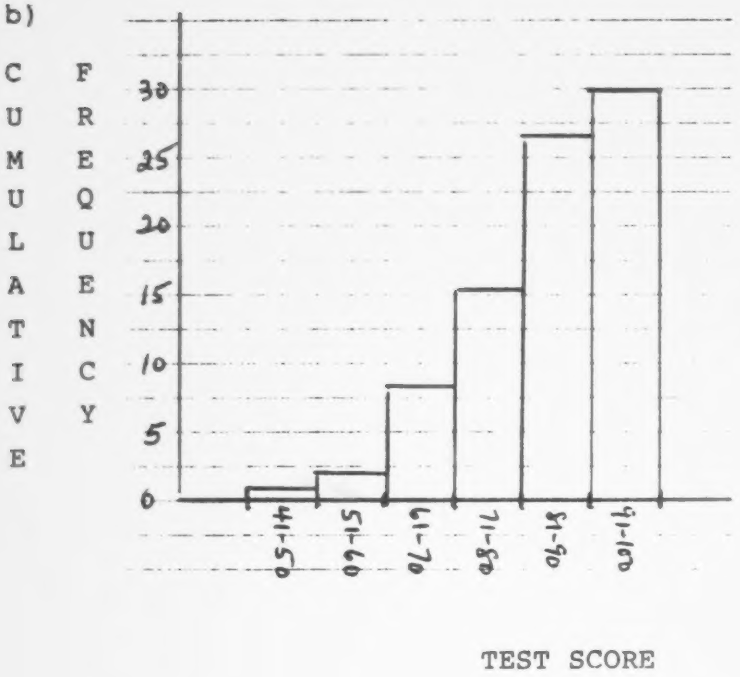
b) Construct a cumulative frequency histogram.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a)

Scores	Frequency	Cumulative Frequency
41 - 50	1	1
51 - 60	1	2
61 - 70	6	8
71 - 80	8	16
81 - 90	11	27
91 - 100	3	30

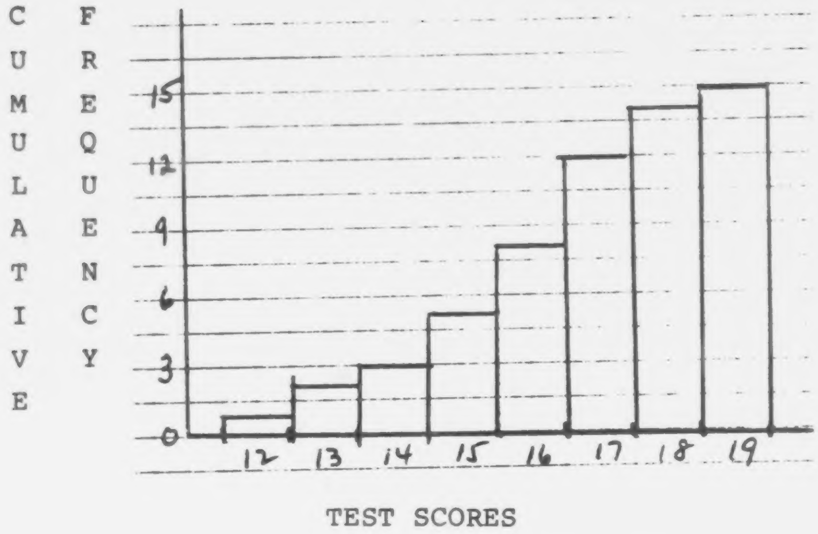
b)



2. a)

Test Scores	Tally	Frequency	Cumulative Frequency
12	/	1	1
13	/	1	2
14	/	1	3
15	//	2	5
16	///	3	8
17	////	4	12
18	//	2	14
19	/	1	15

b)



SUMMARY:

1. What is a cumulative frequency histogram?
2. Why do we use a cumulative frequency histogram?
3. What are the steps in constructing a cumulative frequency histogram?

CONSUMER MATHEMATICS
TABLES, CHARTS AND GRAPHS
LESSON: 13

AIM: How do we read and interpret line graphs?

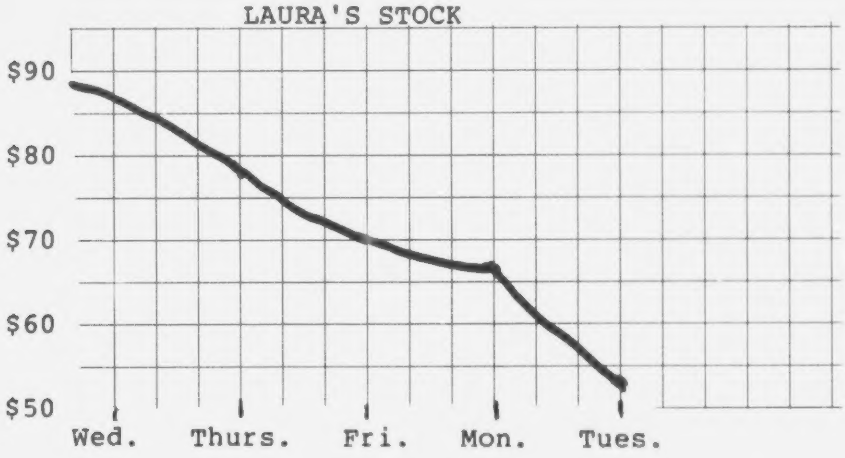
PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify line graphs as a type of graph that shows trend.
2. Read the numerical quantities represented on a line graph.
3. Use a line graph to answer questions, solve problems or make decisions based upon the data presented.

VOCABULARY: trend, line graph

MOTIVATION:

Laura looked in the newspaper to see how the stock her grandfather gave her was doing for the past week.



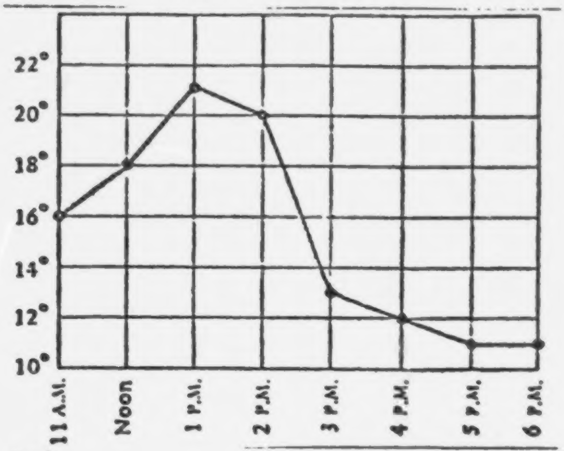
Ask, "Do you think Laura was happy with her stock this week? Explain?" Elicit: No, because it was decreasing in value. Ask, "What does this graph tell us about the pattern of Laura's stock over the past week?" Elicit: It is steadily declining in value.

DEVELOPMENT:

1. Develop the kind of graph displayed in the motivation problem as a kind of line graph. Line graphs show changes that take place in numerical facts. It pictures the trend of the quantity graphed.
2. Using the motivation problem ask:
   a) What was the price of the stock on Wednesday? Friday? Tuesday? Elicit: $88, $70, $52.
   b) By how much had the price of the stock decreased over the week? Elicit: $36.
   c) What was the percent decrease over the week? Elicit: Approximately 41%.
   d) If Laura's stock increases 25% from Tuesday to Wednesday, what would be the price of the stock on Wednesday? Elicit: $65.
3. Do Application #1.
4. Do Application #2.

APPLICATIONS:

1. TEMPERATURES IN OUR CITY TODAY (IN C°)



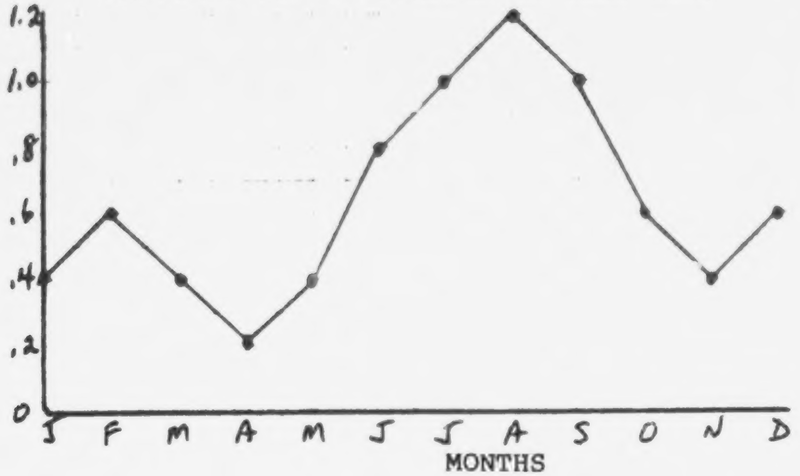
Ask:

a) What was the temperature at 3 P.M.? Noon?
b) At what time was the temperature 16° C?
c) Between what hours was the temperature increasing?
d) Between what hours did the temperature drop the sharpest?

e) What reason might you give for the sharp decrease in the temperature record in part d?

f) Between what hours did the temperature remain the same?

2. NORMAL MONTHLY RAINFALL IN THIS CITY



Ask:

a) Which is the wettest month in This City?

b) What is the normal total annual rainfall?

c) In which month would you plan to visit This City to avoid rainy weather?

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 3 P.M. - 13° C, Noon - 18° C.
   b) 11 A.M.
   c) 11 A.M. - 1 P.M.
   d) 2 P.M. - 3 P.M.
   e) A cold front passed through Our City.
   f) 5 P.M. - 6 P.M.
2. a) August
   b) 7.6
   c) April

SUMMARY:

1. What kind of information do line graphs generally give us?

CONSUMER MATHEMATICS

TABLES, CHARTS AND GRAPHS

LESSON: 14

AIM: How do we construct line graphs?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Determine what scales and what intervals to use in constructing a line graph.
2. Construct a line graph from statistical data.

VOCABULARY:

MOTIVATION:

Mrs. Steel wished to visually record the monthly sales in her gift shop for the past year. If she were interested in showing increases and/or decreases (trends or patterns) ask: "What type of graph should she construct?" Elicit: A line graph shows trend.

DEVELOPMENT:

1. Review line graphs from the previous lesson. Emphasis should be placed on the vertical and horizontal scales.
2. Ask:
   a) If we wished to construct a line graph to visually represent Mrs. Steel's monthly gift shop sales, what information would we need? Elicit: Monthly sales amounts.
   b) What would we place on the vertical scale? Horizontal scale? Elicit: Sales amounts, months.
   c) What would be an appropriate title for the graph? Elicit: Mrs. Steel's Gift Shop Monthly Sales.
3. Given the following information, carefully construct a line graph.

Month	J	F	M	A	M	J	J	A	S	O	N	D
Sales in $1000	1	2	1	2	3	3	2	3	4	5	4	3

4. Do Application #1.
5. Indicate that rounding off may be necessary before points can be plotted.
6. Do Application #2.
7. Indicate that line graphs need not start at 0 since we are not comparing data but indicating a trend or pattern.
8. Do Application #3.
9. Review the steps in constructing a line graph:
   a) List the information to be graphed.
   b) Round off data, if necessary.
   c) Plan the scales.
   d) Mark off the appropriate values on the scales.
   e) Plot the points.
   f) Draw straight lines connecting points.
   g) Give a title to the graph.

APPLICATIONS:

1. Make a line graph of the percent of working population in farm occupations.

Year	1910	1920	1930	1940	1950	1960	1970	1980
Percent	32	27	22	16	12	9	4	3

2. The number of automobile sales made in the U.S. from 1960-1980 was as follows:

   1960 - 6,898,117
   1965 - 8,004,298
   1970 - 9,156,317
   1975 - 11,046,918
   1980 - 14,905,126
   1985 - 15,504,773

   Construct a line graph.

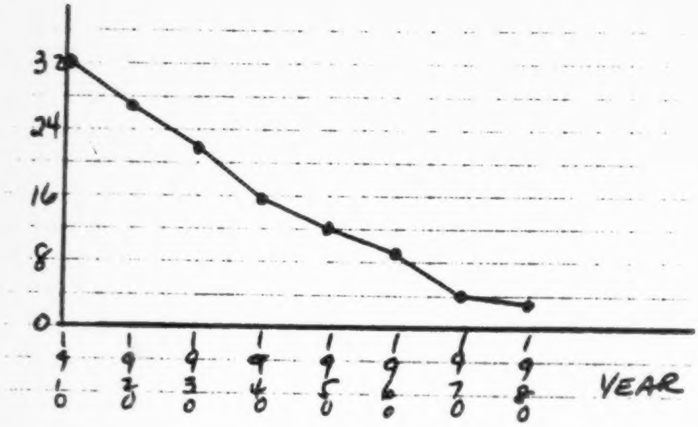
3. On a certain day, the Weather Bureau recorded the following temperatures:

HOUR	11 AM	Noon	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM
TEMPERATURE (IN F°)	18°	20°	25°	30°	22°	19°	18°	15°

4. Appropriate questions, like those asked in the previous lesson, should be directed to these applications upon completion of each graph.

SOLUTIONS TO APPLICATION PROBLEMS:

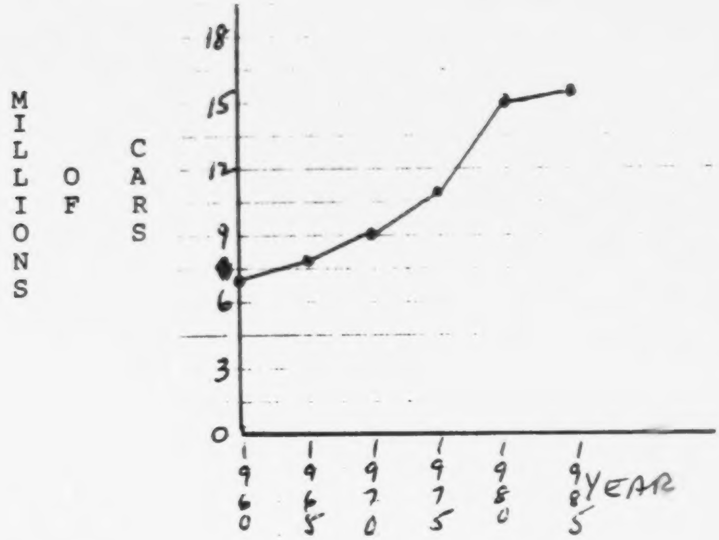
1. WORKING POPULATION IN FARM OCCUPATIONS



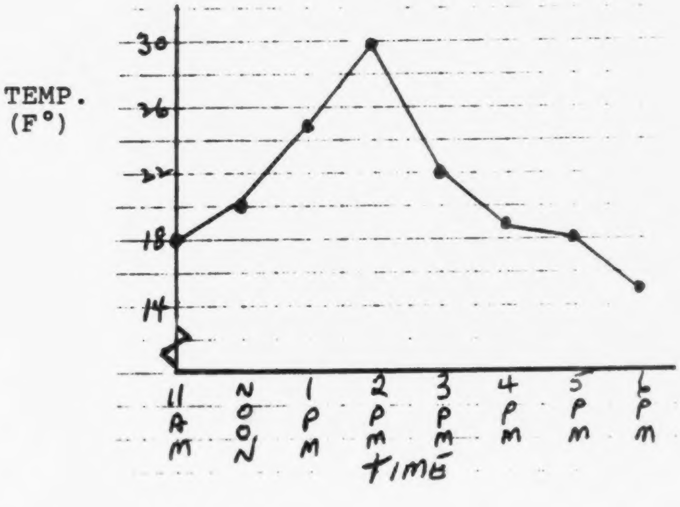
2. Round off the numerical values:

1960 - 7 million
1965 - 8 million
1970 - 9 million
1975 - 11 million
1980 - 15 million
1985 - 15.5 million

NUMBER OF AUTO SALES 1960 - 1980



3. WEATHER BUREAU TEMPERATURE READINGS



SUMMARY:

1. What are the steps in constructing a line graph?

CONSUMER MATHEMATICS

TABLES, CHARTS AND GRAPHS

LESSON: 15

AIM: How do we read and interpret circle graphs?

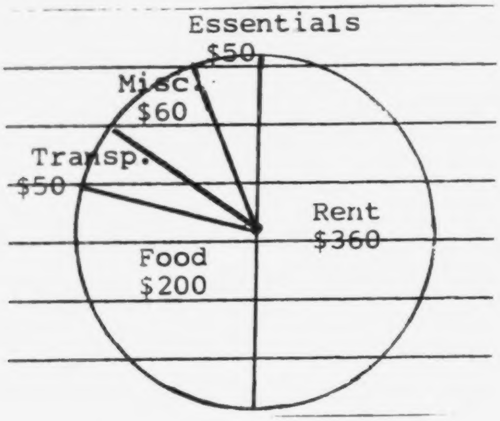
PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify circle graphs as a type of graph that shows part of a whole.
2. Read circle graphs where sectors are given in numerical quantities, percents or degree measure.
3. Use a circle graph to answer questions, solve problems or make decisions based upon the data presented.

VOCABULARY: circle graph, sector, central angle

MOTIVATION:

Christy graduated school, got a job and decided she needed to budget her money. She asked her brother to help her. After a few days her brother presented her with the following budget based on her current monthly salary:



Indicate that this graph is called a circle graph. Ask, "What was Christy's monthly salary?" Elicit: $720.

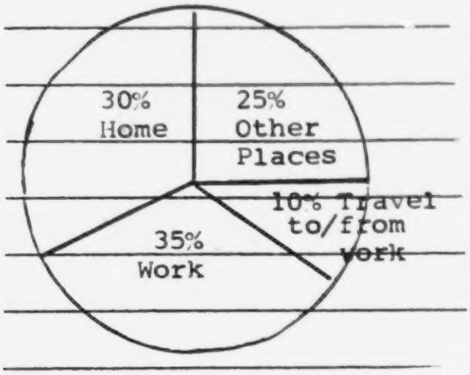
DEVELOPMENT:

1. Using the motivation problems, students should be able to answer the following. Ask:
   a) What is Christy's biggest monthly expense? Elicit: Rent.
   b) If she had to cut items in her budget, what items would be easiest to reduce? Elicit: Misc. and food.
   c) What items might be covered under essentials? Misc? Elicit: Insurance, clothing, furniture, gifts, entertainment, savings.
2. Define sector (piece of the pie) as part of a circle formed by two radii.
3. Do Application #1.
4. Students should realize that in addition to specific amounts, circle graphs can have sectors which are represented by percents or by degree measure.
5. Do Application #2.
6. Ask, "Why do we use circle graphs?" Elicit: To show how one quantity has been divided into parts and the comparison of these parts.
7. Do Application #3.

APPLICATIONS:

1. Show the following circle graph:

   WHERE PEOPLE HAVE ACCIDENTS



Ask:

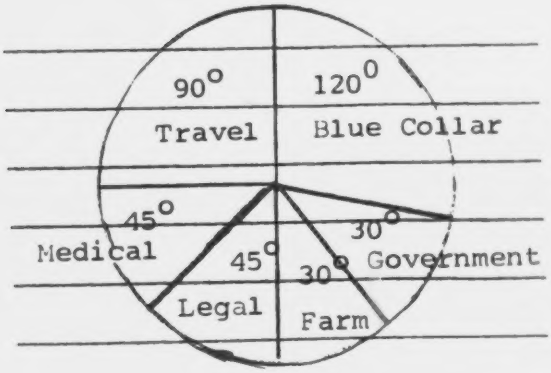
a) Where do the greatest number of accidents occur?

b) How many more times likely are people going to have accidents at home than travelling?

c) Where do people have to be especially careful in order to avoid accidents?

d) If there were 1000 accidents in your town, approximately how many occurred at home?

2. OCCUPATIONS



Discuss:

a) Each angle is called a central angle.

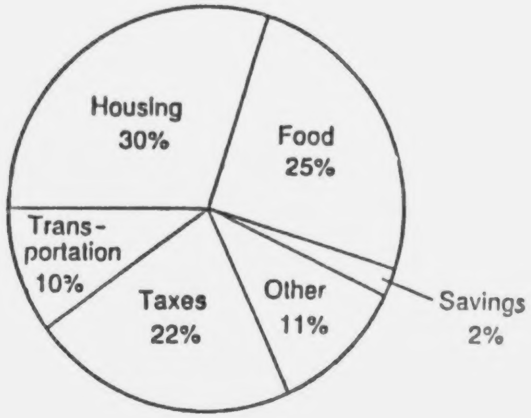
b) Sum of the central angles is always 360°.

Ask similar questions as in Application #1, such as:

a) What part of the circle does travel represent?

b) If 100,000,000 people are in the work force, how many work in travel related jobs?

3. ALLEN FAMILY BUDGET ($18,750/Year)



Ask:

a) Which budget item is 1/3 of the cost of housing?
b) What is the total percent spent on food and housing?
c) Find the dollar amount budgeted for each item.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) At work.
b) 3 times.
c) At work.
d) 300

2. a) 1/4
b) 25,000,000

3. a) Transportation.
b) 55%
c) Housing 30% of $18,750 = $5,625
Food 25% of $18,750 = $4,687.50
Taxes 22% of $18,750 = $4,125
Savings 2% of $18,750 = $ 375
Other 11% of $18,750 = $2,062.50
Transp. 10% of $18,750 = $1,875

$18,750.

SUMMARY:

1. Why do we use circle graphs?
2. What three ways can we represent the sectors of a circle graph?

CONSUMER MATHEMATICS

TABLES, CHARTS AND GRAPHS

LESSON: 16

AIM: How do we prepare to construct circle graphs?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Make a table to convert numerical quantities or percents to degree measures.
2. Use a protractor to construct angles of a given degree measure.

VOCABULARY: protractor

MOTIVATION:

The students in a health education class voted to select the following activities: baseball, 18; basketball, 20; swimming, 12; track, 10. Ask, "If a circle represented the entire health education class and we wished to divide the circle into parts, how would we know how big to make each sector? Elicit: We would have to know what part of the circle each activity represents or the number of degrees each part represents.

DEVELOPMENT:

1. Using the motivation question, help the students to develop a table where they will be able to convert the numerical data into degree measure.

ACTIVITY	Baseball	Basketball	Swimming	Track
NUMBER	18	20	12	10
DEGREES				

Add 18 + 20 + 12 + 10 equals 60 total parts.

Fractional part x 360° = degree measure of each sector.

$\frac{18}{60} \times 360° = 108°$ $\frac{20}{60} \times 360° = 120°$

$\frac{12}{60} \times 360° = 72°$ $\frac{10}{60} \times 360° = \underline{60°}$

TOTAL = 360°

399

Have students practice multiplication of fractions (One suggestion would be to review this skill in the previous night's homework.)

2. Do Application #1.
3. Do Application #2 and help students convert percents to degree measure.
4. Students should practice drawing angles of varying degrees by using a protractor. (A large board protractor or overhead projector would be an effective tool.)
5. Do Application #3.

APPLICATIONS:

1. Birthplaces of the first 10 Presidents of the United States by state are:

STATE	Virginia	Mass.	South Car.	New York
NUMBER	6	2	1	1

Convert the numerical data to degree measure in preparation for constructing a circle graph.

2. Jose's budget is indicated below. Convert the percents to degrees.

Food - 25%
Clothing - 20%
Transp. - 15%
Rent - 30%
Savings - 5%
Misc. - 5%

3. Using a protractor, draw angles with the following measures:

a) 90°
b) 45°
c) 30°
d) 60°
e) 25°
f) 83°
g) 108°
h) 155°

SOLUTIONS TO APPLICATION PROBLEMS:

1. Virginia: $\frac{6}{10} \times 360^\circ = 216^\circ$

   Mass: $\frac{2}{10} \times 360^\circ = 72^\circ$

   South Car: $\frac{1}{10} \times 360^\circ = 36^\circ$

   New York: $\frac{1}{10} \times 360^\circ = 36^\circ$

2. Food: $\frac{25}{100} \times 360^\circ = 90^\circ$

   Clothing: $\frac{20}{100} \times 360^\circ = 72^\circ$

   Transp: $\frac{15}{100} \times 360^\circ = 54^\circ$

   Rent: $\frac{30}{100} \times 360^\circ = 108^\circ$

   Savings: $\frac{5}{100} \times 360^\circ = 18^\circ$

   Misc: $\frac{5}{100} \times 360^\circ = 18^\circ$

3. Follow the steps to use a protractor in drawing an angle of 90°.
   - a) Start with an initial line.
   - b) Place the center of the protractor at one endpoint and position the protractor so that the guideline along the bottom lies on the initial line.
   - c) Look for the 90° mark on the protractor, place a mark on the paper to indicate the angle measure.
   - d) Connect the endpoint of the initial line with the mark made at 90°.

SUMMARY:

1. How do we convert numerical quantities to degree measures in order to make a circle graph?
2. How do we convert percents to degree measures in order to make a circle graph?
3. How do we draw angles of a given degree measure?

CONSUMER MATHEMATICS

TABLES, CHARTS AND GRAPHS

LESSON: 17

AIM: How do we construct circle graphs?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Take data given in numerical quantities or percents and prepare a table of angles in degree measure.
2. Construct a circle graph using statistical data.

VOCABULARY:

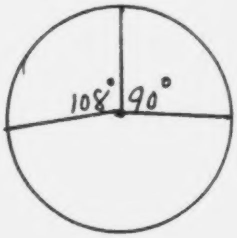
MOTIVATION:

Complete the following table which represents the causes of fatal automobile accidents:

CAUSE	PERCENT	MEASURE OF CENTRAL ANGLE IN DEGREES
Speeding	25%	
Inattention	30%	
Violations	20%	
Drunk Driving	15%	
Misc.	10%	

DEVELOPMENT:

1. Through the motivation problem students will review converting percents to degree measure in preparation for constructing a circle graph.
   Speeding: 90°, Inattention: 108°, Violations: 72°, Drunk Driving: 54°, Misc: 36°.
2. Draw a circle with one radius. Using the radius measure off a 90° angle with a protractor.



Next use the new radius to measure off a 108° angle. Continue until all angles have been placed in the circle. Label the sectors and give the graph a title.

3. Do Application #1.

4. Review converting numerical quantities to degree measure.
   a) Add up the numerical quantities = total.
   b) Represent each sector as a part of the whole:

      $\frac{\text{each num. quant.}}{\text{total}}$

   c) Multiply each fraction in b) by 360°:

      $\frac{\text{each num. quant.}}{\text{total}} \times 360° =$ degree measure of each central angle.

5. Do Application #2.

6. Review steps to follow in constructing a circle graph:
   a) List the numerical information.
   b) Round off, if necessary.
   c) Make a table to convert numerical quantities or percents to number of degrees in the central angle of each sector.
   d) Draw a circle.
   e) Using a protractor, measure the central angle of each part.
   f) Label each sector.
   g) Give a title to the graph.

APPLICATIONS:

1. Construct a circle graph of the following data:
   Mr. Williams listed the following expenses for his home for the year:

Taxes	-	$400
Interest	-	$200
Heat	-	$250
Insurance	-	$100
Repairs	-	$200
Misc.	-	$ 50

2. The books in Ms. Levine's library are distributed as follows:

Fiction	-	$33\frac{1}{3}\%$
Math	-	25%
Non-fiction	-	$16\frac{2}{3}\%$
Drama	-	15%
Others	-	10%

Construct a circle graph of the above data.

SOLUTIONS TO APPLICATION PROBLEMS:

1. Total = $1200.

$$\frac{400}{1200} \times 360° = 120°$$

$$\frac{200}{1200} \times 360° = 60°$$

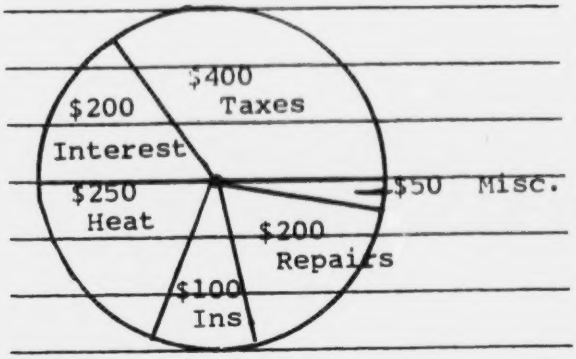
$$\frac{250}{1200} \times 360° = 75°$$

$$\frac{100}{1200} \times 360° = 30°$$

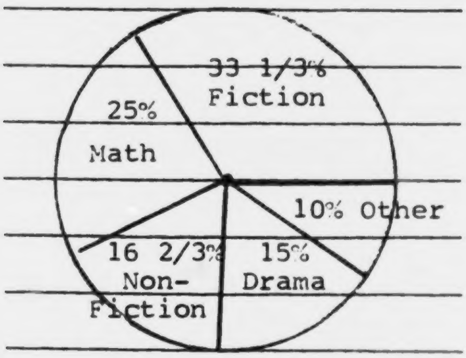
$$\frac{200}{1200} \times 360° = 60°$$

$$\frac{50}{1200} \times 360° = 15°$$

MR. WILLIAMS HOME EXPENSES



BOOKS IN MS. LEVINE'S LIBRARY



2. $33\frac{1}{3}\% = 1/3,\ 1/3 \times 360° = 120°$

$25\% = 1/4,\ 1/4 \times 360° = 90°$

$16\frac{2}{3} = 1/6,\ 1/6 \times 360° = 60°$

$15\% = 3/20,\ 3/20 \times 360° = 54°$

$10\% = 1/10,\ 1/10 \times 360° = \underline{36°}$

$360°$

SUMMARY:

1. What steps do we use in preparing numerical data for use in constructing a circle graph?
2. What steps do we use in preparing percents for use in constructing a circle graph?
3. How do we construct a circle graph when the data has been converted to degree measure?

CONSUMER MATHEMATICS
TABLES, CHARTS AND GRAPHS
LESSON: 18

AIM: How do we apply our knowledge of statistics to help us be better consumers?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Read and interpret tax tables.
2. Use tax tables to solve problems.
3. Read and interpret graphs providing information on tax monies.

VOCABULARY:

MOTIVATION:

We have learned many ideas and concepts relating to the use of tables, charts, graphs and statistics. We now have to apply this knowledge to the solution of the practical problems which will help us be better consumers.

For example, paying taxes is a fact of life. When we work, certain taxes are deducted from our wages. Ask, "What taxes are deducted from a person's salary?" Elicit: Federal, state and city income taxes and Social Security tax (FICA).

DEVELOPMENT:

1. Distribute a copy of Table 1. WEEKLY Payroll period and explain how to read and interpret the table.
   a) Single person vs. married person.
   b) Finding their weekly salary listed in the chart.
   c) Calculating the amount of Income tax to be withheld.
2. Do Application #1.
3. Do Application #2.
4. Explain that the Government (Federal, State or City) often informs us about tax monies through the use of graphs.

5. Do Application #3.

APPLICATIONS:

1. Using Table 1. WEEKLY Payroll period ask:
   How much income tax will Michael Paul have withheld from his pay if he is:
   a) Single and earns $225 per week.
   b) Married earning $225 per week.
   c) Single earning $500 per week.
   d) Married earning $600 per week.

TABLE 1. WEEKLY Payroll Period

(a) SINGLE person—including head of household:

If the amount of wages is: | *The amount of income tax to be withheld shall be:*

Not over $27 0

Over—	But not over—		of excess over—
$27	—$63	15%	—$27
$63	—$131	$5.40 plus 18%	—$63
$131	—$196	$17.64 plus 21%	—$131
$196	—$273	$31.29 plus 26%	—$196
$273	—$331	$51.31 plus 30%	—$273
$331	—$433	$68.71 plus 34%	—$331
$433		$103.39 plus 39%	—$433

(b) MARRIED person—

If the amount of wages is: | *The amount of income tax to be withheld shall be:*

Not over $46 0

Over—	But not over—		of excess over—
$46	—$127	15%	—$46
$127	—$210	$12.15 plus 18%	—$127
$210	—$288	$27.09 plus 21%	—$210
$288	—$369	$43.47 plus 24%	—$288
$369	—$454	$62.91 plus 28%	—$369
$454	—$556	$86.71 plus 32%	—$454
$556		$119.35 plus 37%	—$556

2. Using a copy of Schedule Y from the Federal tax schedule ask:
   How much tax will Michael Paul pay if he is:
   a) Married filing separately and his taxable income is $13,000.
   b) Married filing jointly and his taxable income is $40,000.
   c) A widower whose taxable income is $200,000.
   d) Married filing separately whose taxable income is $100,000.

(See next page for Schedule Y.)

Schedule Y

Married Taxpayers and Qualifying Widows and Widowers

Married Filing Joint Returns and Qualifying Widows and Widowers

Use this schedule if you checked **Filing Status Box 2 or 5** on Form 1040—

If the amount on Form 1040, line 37 is: *Over—*	*But not over—*	Enter on Form 1040, line 38	*of the amount over—*
$0	$3,400	—0—	
3,400	5,500	.......11%	**$3,400**
5,500	7,600	**$231 + 12%**	**5,500**
7,600	11,900	**483 + 14%**	**7,600**
11,900	16,000	**1,085 + 16%**	**11,900**
16,000	20,200	**1,741 + 18%**	**16,000**
20,200	24,600	**2,497 + 22%**	**20,200**
24,600	29,900	**3,465 + 25%**	**24,600**
29,900	35,200	**4,790 + 28%**	**29,900**
35,200	45,800	**6,274 + 33%**	**35,200**
45,800	60,000	**9,772 + 38%**	**45,800**
60,000	85,600	**15,168 + 42%**	**60,000**
85,600	109,400	**25,920 + 45%**	**85,600**
109,400	162,400	**36,630 + 49%**	**109,400**
162,400	....	**62,600 + 50%**	**162,400**

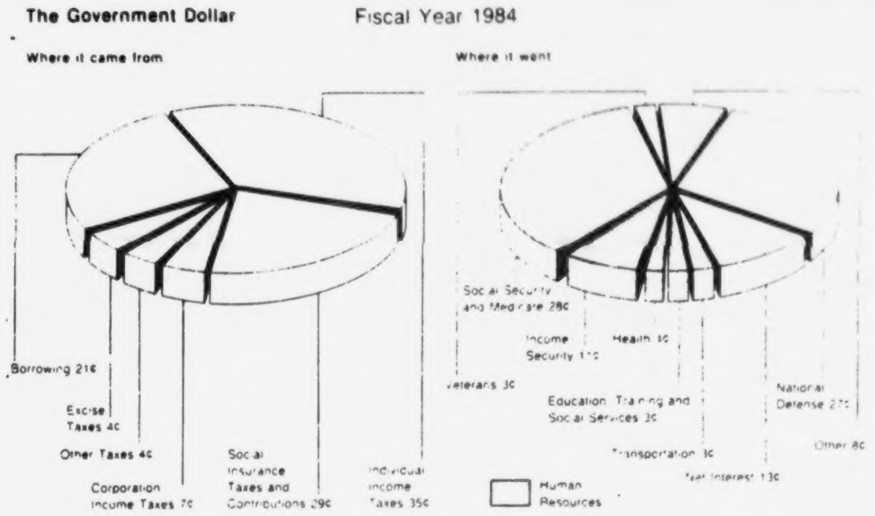
Married Filing Separate Returns

Use this schedule if you checked **Filing Status Box 3** on Form 1040—

If the amount on Form 1040, line 37 is: *Over—*	*But not over—*	Enter on Form 1040, line 38	*of the amount over—*
$0	$1,700	—0—	
1,700	2,750	.......11%	**$1,700**
2,750	3,800	**$115.50 + 12%**	**2,750**
3,800	5,950	**241.50 + 14%**	**3,800**
5,950	8,000	**542.50 + 16%**	**5,950**
8,000	10,100	**870.50 + 18%**	**8,000**
10,100	12,300	**1,248.50 + 22%**	**10,100**
12,300	14,950	**1,732.50 + 25%**	**12,300**
14,950	17,600	**2,395.00 + 28%**	**14,950**
17,600	22,900	**3,137.00 + 33%**	**17,600**
22,900	30,000	**4,886.00 + 38%**	**22,900**
30,000	42,800	**7,584.00 + 42%**	**30,000**
42,800	54,700	**12,960.00 + 45%**	**42,800**
54,700	81,200	**18,315.00 + 49%**	**54,700**
81,200	....	**31,300.00 + 50%**	**81,200**

3. Using a copy of "The Government Dollar" 1984 ask:
   a) Where does most of the Government's money come from?
   b) Where does most of it go?
   c) What is meant by Human Resources?
   d) How much more is received by the Government from individual income taxes than from corporation income taxes?

(See next page.)



SOLUTIONS TO APPLICATION PROBLEMS:

1. a) $31.29 plus 26% of excess over $196 = $38.83.
   b) $27.09 plus 21% of excess over $210 = $30.24.
   c) $103.39 plus 39% of excess over $433 = $129.52.
   d) $119.35 plus 37% of excess over $556 = $135.63.

2. a) $1732.50 plus 25% of amount over $12,300 = $1907.50.
   b) $6274 plus 33% of amount over $35,200 = $7858.
   c) $62,600 plus 50% of amount over $162,400 = $81,400.
   d) $31,300 plus 50% of amount over $81,200 = $40,700.

3. a) Individual Income Taxes.
   b) Social Security and Medicare.
   c) Monies given to manage those programs which deal with human needs (i.e. medical care, education, training, veterans benefits).
   d) Five times as much (35¢ vs 7¢ or 28¢ for each dollar received).

SUMMARY:

1. How do we apply our knowledge of tax tables and graphs pertaining to taxes to help us be better consumers?

CONSUMER MATHEMATICS
TABLES, CHARTS AND GRAPHS
LESSON: 19

AIM: How do we apply our knowledge of statistics to help us be better consumers? (Part 2)

PERFORMANCE OBJECTIVES: The student will be able to...

1. Read and interpret mailing, postage, shipping and insurance tables.
2. Use mailing, postage, shipping and insurance tables to solve problems.

VOCABULARY:

MOTIVATION:

Mr. Jones decided to purchase life insurance. Ask, "What factors must he consider before purchasing life insurance?"

DEVELOPMENT:

1. Using the motivation question, students should consider the following factors before purchasing life insurance:
   a) The kind of policy - straight life, paid-up life, term, endowment or annuity, etc.
   b) The benefits the policy provides - dividends, cash surrender value, loan value, etc.
   c) How much insurance to purchase.
   d) What the premiums will be.
   e) How often the premiums are paid.
2. Do Application #1.
3. Introduce the task of mailing packages as another area where consumers must be aware of the factors which will determine the cost of mailing a package.
   a) Weight of the package.
   b) Size of the package.
   c) Type of mailing - first class, fourth class, parcel post, etc.
   d) Where it is being mailed to.

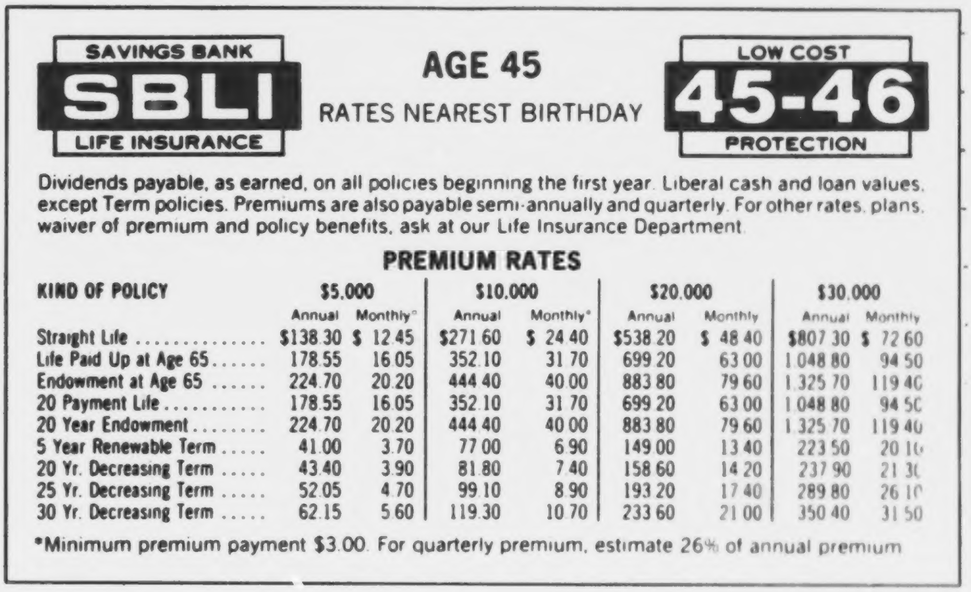
4. Do Application #2.

5. Discuss other types of insurance.
   a) Home
   b) Fire
   c) Automobile
   d) Travel, etc.

6. Do Application #3.

APPLICATIONS:

1.



SAVINGS BANK
SBLI
LIFE INSURANCE

AGE 45
RATES NEAREST BIRTHDAY

LOW COST
45-46
PROTECTION

Dividends payable, as earned, on all policies beginning the first year. Liberal cash and loan values, except Term policies. Premiums are also payable semi-annually and quarterly. For other rates, plans, waiver of premium and policy benefits, ask at our Life Insurance Department.

PREMIUM RATES

KIND OF POLICY	$5,000		$10,000		$20,000		$30,000	
	Annual	Monthly*	Annual	Monthly*	Annual	Monthly	Annual	Monthly
Straight Life	$138.30	$ 12.45	$271.60	$ 24.40	$538.20	$ 48.40	$807.30	$ 72.60
Life Paid Up at Age 65	178.55	16.05	352.10	31.70	699.20	63.00	1,048.80	94.50
Endowment at Age 65	224.70	20.20	444.40	40.00	883.80	79.60	1,325.70	119.40
20 Payment Life	178.55	16.05	352.10	31.70	699.20	63.00	1,048.80	94.50
20 Year Endowment	224.70	20.20	444.40	40.00	883.80	79.60	1,325.70	119.40
5 Year Renewable Term	41.00	3.70	77.00	6.90	149.00	13.40	223.50	20.10
20 Yr. Decreasing Term	43.40	3.90	81.80	7.40	158.60	14.20	237.90	21.30
25 Yr. Decreasing Term	52.05	4.70	99.10	8.90	193.20	17.40	289.80	26.10
30 Yr. Decreasing Term	62.15	5.60	119.30	10.70	233.60	21.00	350.40	31.50

*Minimum premium payment $3.00. For quarterly premium, estimate 26% of annual premium

a) Using the table above, what is the cost of one monthly premium for a $5000 straight life insurance policy?

b) What is the total cost of 12 monthly premiums for a $10,000 20-payment life insurance policy?

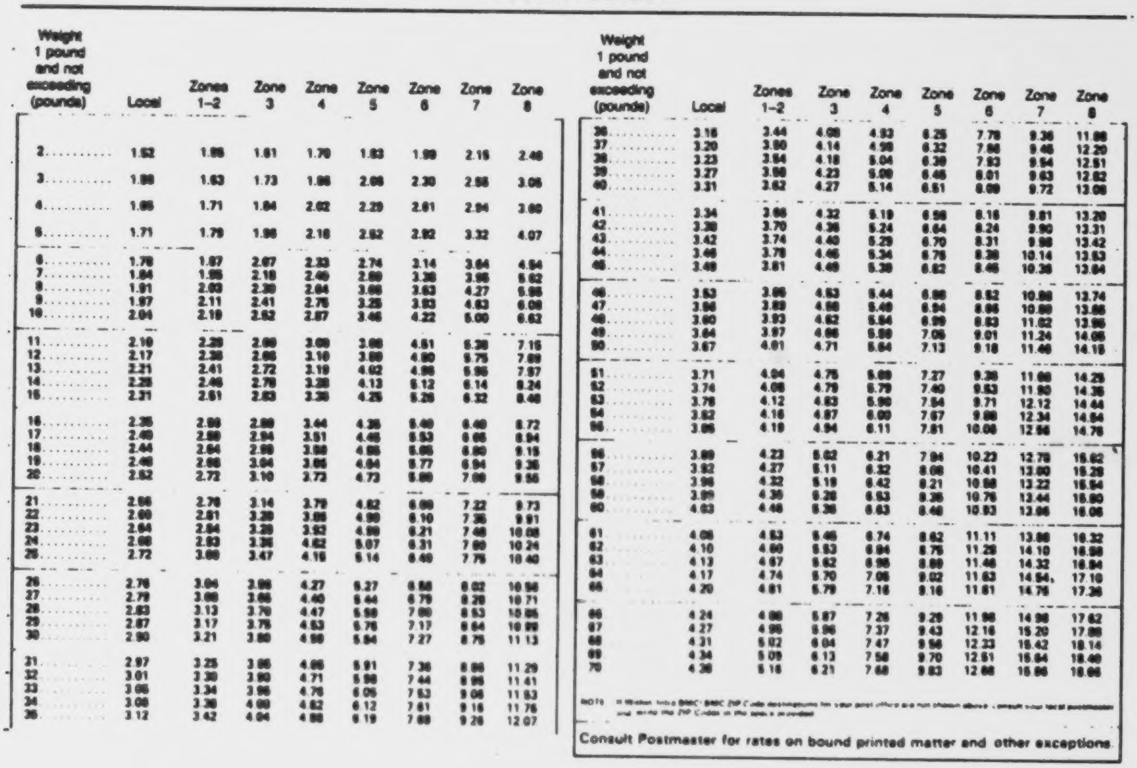
c) How much do you save if you pay an annual premium on the policy in part b?

d) What would be the quarterly premium of a $30,000 20 year endowment policy?

e) How much more would you pay in part d than if you had paid the annual premium?

2. Ellen bought several items at the store for some of her relatives. After deciding on the gifts, she packaged them for mailing. She decided to mail them fourth class mail. Listed below are the gifts and their weights for each relative and where they live. Using the chart for fourth class mail, determine the cost of sending the gifts to each person and the total bill.

FOURTH CLASS



Consult Postmaster for rates on bound printed matter and other exceptions.

a) Aunt Mary - books - 3 lbs. - California (Zone 8)
b) Uncle Joe - tools - 25 lbs. - Texas (Zone 6)
c) Mom and Dad - mixer - $2\frac{1}{2}$ lbs.
- toaster - $3\frac{1}{2}$ lbs.
- blender - 10 lbs. - Florida (Zone 3)
d) Brother - VCR - 20.3 lbs.- Local
e) Sister - tapes - 8.1 lbs.
- recorder - 12.5 lbs.
- camera - 6 lbs. - Maine (Zone 2)

3. Fire insurance is usually a set premium per unit of insurance purchased.
    a) A house was insured for $50,000 at a rate of $6 per $1000, what was the annual premium?
    b) If the premium in part a was paid semi-annually, what is the premium?
    c) Find the annual premium on $6000 worth of boating equipment at a rate of $.17 per $100.
    d) Mr. Carl insured his house for $47,500 at a rate of $.23 per $100 and its contents of $9000 at a rate of $1.20 per $1000. Find the total insurance premium for the year.

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) $12.45
   b) $380.40
   c) $28.30
   d) $344.68
   e) $53.02

2. a) $3.05
   b) $6.40
   c) 16 lbs., $2.89
   d) $2.56
   e) 26.6 lbs., $3.08
   Total bill - $17.98

3. a) $300
   b) $150
   c) $10.20
   d) House - $109.25
   Contents - 10.80
   Total - $120.05

SUMMARY:

1. How do we apply our knowledge of postage and insurance tables to help us be better consumers?

CONSUMER MATHEMATICS
TABLES, CHARTS AND GRAPHS
LESSON: 20

AIM: How do we apply our knowledge of statistics to help us be better consumers? (Part 3)

PERFORMANCE OBJECTIVES: The student will be able to...

1. Read and interpret credit, loan and discounting tables.
2. Use credit, loan and discounting tables to solve problems.

VOCABULARY: credit, loan, discounting

MOTIVATION:

Often people wish to open charge accounts to make purchases of goods and services easier; however they often don't realize that failure to pay their bills on time can result in finance charges or credit charges. It is reasonable to assume that we often purchase things or borrow money knowing we will have to take time to pay for them or for the privilege of borrowing money (a loan). Ask, "What kind of things do people buy that they often pay for over a long period of time?" Elicit: home, car, etc.

DEVELOPMENT:

1. Mr. Bill borrowed $1000 from his Credit Union for one year. The Credit Union presented Mr. Bill with a payment schedule. Based on this schedule, ask: "How much did Mr. Bill pay each month?" Elicit: $88.85. Ask, "What was the total he paid back?" Elicit: $1066.20. Ask: How much interest did he pay? Elicit: $66.20. Ask, "What was the annual percentage rate for this loan?" Elicit: $\frac{66.20}{1000} \approx 7\%$.

Employees' Credit Union
Payment Schedule

Amount	6 Months	12 Months	18 Months	24 Months	30 Months	36 Months
100	17.26	8.89	6.10	4.71	3.88	3.33
200	34.51	17.77	12.20	9.42	7.75	6.65
300	51.77	26.66	18.30	14.13	11.63	9.97
400	69.02	35.54	24.40	18.83	15.50	13.29
500	86.28	44.43	30.50	23.54	19.38	16.61
600	103.53	53.32	36.59	28.25	23.25	19.93
700	120.79	62.20	42.69	32.96	27.13	23.26
800	138.05	71.08	48.79	37.66	31.00	26.58
900	155.30	79.97	54.89	42.37	34.88	28.90
1000	172.55	88.85	60.99	47.08	38.75	33.22
2000	345.10	177.70	121.97	94.15	77.50	66.43
3000	517.65	266.55	181.95	141.23	116.26	99.65

2. Explain that some credit arrangements, particularly on credit cards, are often more complicated.

3. Do Application #1.

4. Students should be aware that some loans are discounted. In a discounted loan, the lender immediately takes off the interest owed (called the discount) and the borrower receives what is left, but repays the entire amount. For example: Sam borrows $500 for one year at 10% interest on a discounted loan.

   INTEREST = Principal x Rate x Time
   $500 x .10 x 1
   INTEREST = $50

   He receives $450 but will pay back $500.

5. Do Application #2.

6. Mortgage loans for homes or other large items are popular examples of using tables to calculate payments.

7. Do Application #3.

APPLICATIONS:

1. Stephen Mark's charge account statement showed an unpaid balance of $170.69. During the month he paid $150 and charged $257.05. The finance charge on the statement was $1.03. What was the new balance at the end of the month? What was the minimum payment required?

NEW BALANCE	MINIMUM PAYMENT
$0 - $20	$100% of balance
$20.01 - $100	$20
$100.01 - $200	$40
$200.01 - $400	$20% of balance
Over $400	$25% of balance

2. Stephen Mark wanted to borrow $150 for 6 months at 8% annual interest on a discounted loan.
   a) What was the interest?
   b) How much money did he receive?
   c) How much money did he have to repay?
   d) What were his monthly payments?

3. Stephen Mark is interested in buying a condo for $48,000. At the savings and loan company, he was told he needs 20% for a down payment. He can borrow the rest at 12.5% annual interest for 25 years. How much does Stephen need for the down payment and what will the monthly payment be?

Amortization of a $1000 Loan

Interest rate	Monthly payment		
	20-year loan	25-year loan	30-year loan
10.0%	$9.66	$9.09	$8.78
10.5%	$9.99	$9.45	$9.15
11.0%	$10.33	$9.81	$9.53
11.5%	$10.66	$10.16	$9.90
12.0%	$11.01	$10.53	$10.29
12.5%	$11.36	$10.90	$10.67
13.0%	$11.72	$11.28	$11.06
13.5%	$12.07	$11.66	$11.45
14.0%	$12.44	$12.04	$11.85
14.5%	$12.80	$12.42	$12.25
15.0%	$13.17	$12.81	$12.64
15.5%	$13.54	$13.20	$13.05
16.0%	$13.92	$13.59	$13.45
16.5%	$14.29	$13.99	$13.86
17.0%	$14.67	$14.38	$14.26
17.5%	$15.05	$14.78	$14.67
18.0%	$15.44	$15.18	$15.08

SOLUTIONS TO APPLICATION PROBLEMS:

1.

	$170.69	bill
-	150.00	payment
	20.69	balance
+	257.05	charges
	277.74	total
+	1.03	finance charge
	$278.77	new balance

$278.77 x 20% = $55.75 minimum payment

2. a) $6
   b) $144
   c) $150
   d) $25

3. $48,000 x 20% = $9600 down payment

$48,000 - 9600 = 38,400 balance

From table $10.90 payment per $1000 on a 12.5% loan

$$\frac{38,400}{1000} = 38.4$$

38.4 x $10.90 = $418.56 monthly payment

SUMMARY:

1. How does our knowledge of credit, loans and discounting help us be better consumers?

CONSUMER MATHEMATICS

INDIRECT MEASUREMENT AND TRIGONOMETRY

LESSON: 1

AIM: What is the difference between direct and indirect measurement?

PERFORMANCE OBJECTIVES: The student will be able to...

1. State whether a direct measurement or indirect measurement is needed in a given situation.
2. Directly measure the area of a rectangle.
3. Indirectly measure the distance an object falls given the time it took to fall (direct measure).

VOCABULARY: direct measurement, indirect measurement

Note: Be sure to have a supply of yardsticks, rulers, or measuring tape available.

MOTIVATION:

1. Pose the following:
   Suppose we were to install carpeting for this classroom. After choosing the type of carpeting we wanted, what other information would be needed before the carpet can be installed?
2. Elicit that we would need the measurements of the room. Using various students and their yardsticks, approximate the dimensions of the room to the nearest foot.
3. Have the class calculate the approximate area of the room, reviewing that Area = Length x Width.

DEVELOPMENT:

1. Explain to the class that in the above we found the length and width by actually making the measurements. We did not count the number of square feet in the room. We were able to CALCULATE it.

DEFINITIONS: 1. A measurement obtainted by using a measuring device such as a ruler, protractor, etc. is called a **"DIRECT MEASUREMENT"**. (Examples - the length and width of this room.)

2. Explain to the class that a measurement which results from calculations is called an **"INDIRECT MEASUREMENT"**. (Example - the area of this room.)

   Ask, "What is the purpose of indirect measurements?"

   Elicit: a) Indirect measurement often saves time.

   b) Sometimes it is nearly impossible to make a direct measurement. It is these cases that make indirect measurement so important. Examples include finding the height of a building, the distance from the earth to the moon, and the distance between New York and London.

3. Do Applications 1(a) through 1(f).

4. Do Applications 2(a) through 2(d).

5. The height of a building can be completed indirectly using several approaches. Today we will learn Galileo's method.

Galileo's Method for Calculating the Height of a Building Indirectly

1. Drop an object from the top of the building.
2. Measure the time it takes until it lands. Call this time t (in seconds).
3. The height of the building(s) is given by $s = 16t^2$. ("Galileo's Formula")

   Example: A pebble takes three seconds to land after it is dropped from the top of a building. How tall is the building?

   Solution:

   $$s = 16t^2$$
   $$s = 16(3)^2$$
   $$s = 16(9) = 144 \text{ feet}$$

6. Do Application 3(a) through 3(d).

* 7. (Optional) Do Application 4.*

8. If time: Have a jar filled with marbles. Have the students a) Guess the total number of marbles.
   b) Get an estimate using volume (Use $\pi r^2 h$).
   c) Count them directly.

APPLICATIONS:

1. In each case tell whether the measurement should be done directly or indirectly. (In some cases, the measurement can be done either way.)
   a) The height of the school building.
   b) The temperature outdoors.
   c) The time.
   d) The weight of an elephant.
   e) Your girlfriend's weight.
   f) The distance from home to school.
2. In each case tell what direct measurements should be made in order to measure the following indirectly.
   a) How long it would take you to walk 15 miles.
   b) The perimeter of a triangle.
   c) The perimeter of an equilateral triangle.
   d) How far you could drive with 20 gallons of gasoline.
3. Use Galileo's formula ($s = 16t^2$) to determine how tall a building is if it takes the following amount of time for an object to fall.
   a) 1 second.
   b) 2 seconds.
   c) 5 seconds.
   d) 1.5 seconds.

* 4. How many seconds would it take an object to fall from the top of a hundred foot building?

5. A supermarket gives 5¢ back on each empty soda can. If you return 214 cans what will you get in return?

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) indirectly b) directly c) directly d) directly
   e) indirectly f) directly

2. a) How long it takes to walk 1 mile.
   b) The lengths of the three sides.
   c) The length of one side.
   d) How far your car can travel on one gallon of gas (your "mpg").

3. a) 16 feet
   b) 64 feet
   c) 400 feet
   d) 36 feet

* 4.

$$\begin{aligned} s &= 16t^2 \\ 100 &= 16t^2 \\ 6.25 &= t^2 \\ t &= 2.5 \text{ seconds} \end{aligned}$$

5. $10.70

SUMMARY:

Ask, "What is the difference between direct and indirect measurement?"

CONSUMER MATHEMATICS

INDIRECT MEASUREMENT AND TRIGONOMETRY

LESSON: 2

AIM: How do we use scale drawings and maps to find the distances between places.

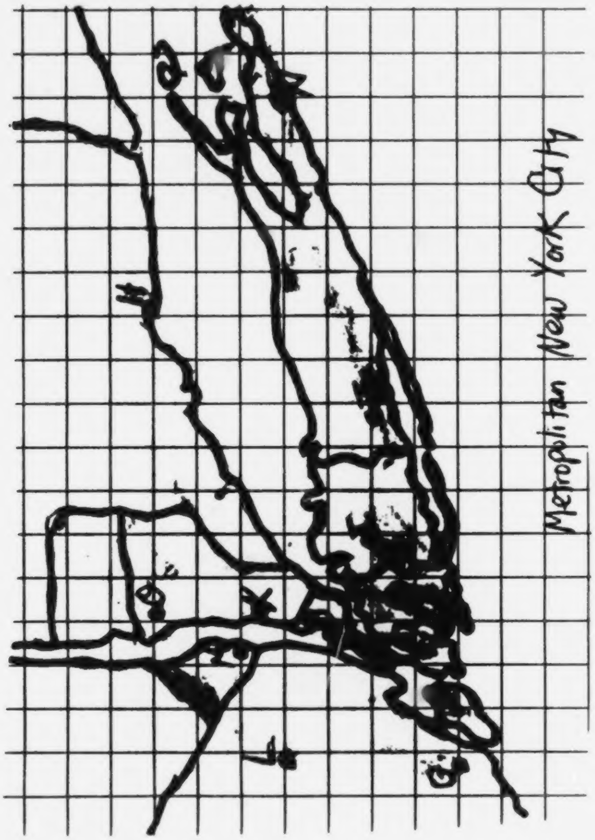
PERFORMANCE OBJECTIVES: The student will be able to...

1. Use a scale and a drawing (or map) to approximate distances.
2. Use a scale diagram to approximate lengths in blueprints and other diagrams.

VOCABULARY: scale, scale drawing

Note: Be sure that your students have rulers today.

MOTIVATION:



A - Midtown Manhattan
B - Downtown Brooklyn
C - Jamaica, Queens
D - Riverdale (Bronx)
E - St. George (Staten Island)
F - Flushing (Queens)
G - Elizabeth, New Jersey
H - New Haven, Connecticut
I - Mineola (Nassau County)
J - Babylon (Suffolk County)
K - Dobbs Ferry (Westchester)
L - Paterson, New Jersey
M - New City (Rockland County)
N - East Hampton, Long Island
O - Peekskill (Westchester)

1. Distribute the above map of the Metropolitan New York Area. Ask the class to approximate the following distances:
   1) Midtown Manhattan to New City
   2) Downtown Brooklyn to Flushing
   3) Paterson, N.J. to East Hampton
   4) Riverdale to Peekskill
   5) Peekskill to New Haven
2. Elicit that this is impossible since further information is needed. Ask, "What else would be useful to know in order to answer these questions?" Elicit that it would be helpful to know how many miles the side of each square of the grid represents.

DEVELOPMENT:

1. Tell the class that we must first define TWO new terms.

   DEFINITIONS:

   a) **Scale Drawing** is a diagram, picture, map, etc. in which actual measurements can be found indirectly by making measurements in the diagram.

   b) A **Scale** shows the relationship between the measurements of the diagram and the actual measurement.
2. Tell the class that in the map, the length of each box represents eight miles. Now have the class estimate the five distances that were given [(1) 24 miles 2) 8 miles 3) 120 miles 4) 28 miles 5) 56 miles).]
3. Challenge each student to compose a problem regarding this map. They must be able to answer their own problems! Have several students present their problems. Oblique lengths can be estimated using rulers.
4. Do Applications 2(a) through 2(e).
5. Do Applications 3 through 6.

APPLICATIONS:

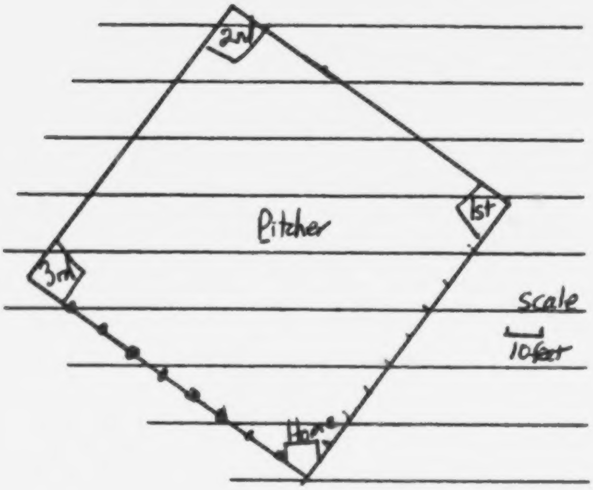
1. In the map of New York given out, find
   a) The distance from St. George to Jamaica.

b) The distance from Riverdale to Babylon.

c) How far New City is from the easternmost tip of Long Island.

d) How many boxes would separate places 80 miles apart.

e) How many boxes would separate places 100 miles apart.


2nd
1st
Pitcher
3rd
Home
Scale
10 feet

Use the scale model of the baseball field to estimate

a) How far it is from Home to first base.

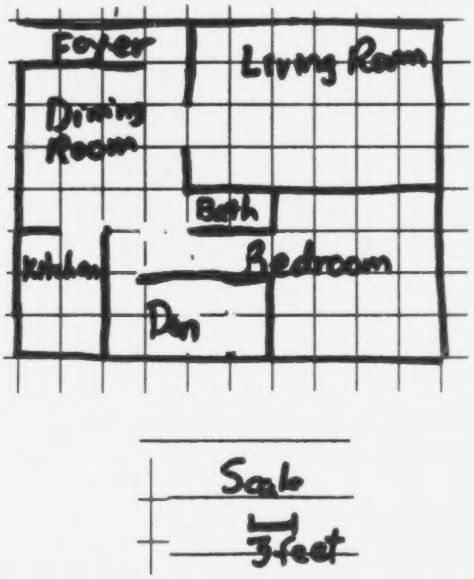
b) How far it is from first to second base.

c) How far the pitcher is from home.

d) How far second base is from home (the most direct path).

e) How far the pitcher is from first base.

Questions 3-6


Foyer
Living Room
Dining Room
Bath
Kitchen
Bedroom
Den
Scale
3 feet

3. Use this floor plan to the dimensions of the
   a) living room b) bedroom
   c) kitchen.

4. How long is the foyer?

5. How many square yards of wall to wall carpeting are needed to cover the living room?

6. Which is larger, the den or the kitchen?

SOLUTIONS TO APPLICATION PROBLEMS:

1. a) 16 miles b) 40 miles c) about 118 miles
   d) 10 boxes e) 12.5 boxes

2. a) 90 feet b) 90 feet c) about 60 feet
   d) about 125 feet e) about 60 feet

   Note: More accurately the answer for c) and e) are 63.6 feet for d) 127.3 feet.

3. a) 12 feet by 18 feet
   b) 12 feet by 12 feet
   c) 6 feet by 6 feet

4. 12 feet long

5. 24 square yards

6. The den has 8 square yards while the kitchen has 6 square yards. Thus the den is larger.

SUMMARY:

Ask, "How do we use the scale to find an actual length in a scale diagram?"

CONSUMER MATHEMATICS
INDIRECT MEASUREMENT AND TRIGONOMETRY
LESSON: 3

AIM: What are similar triangles; under what conditions are two triangles similar?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Show whether or not two triangles are similar (by AA=AA).
2. Use similar triangles to set up a proportion to find the length of a side.

VOCABULARY: similar triangles, proportion

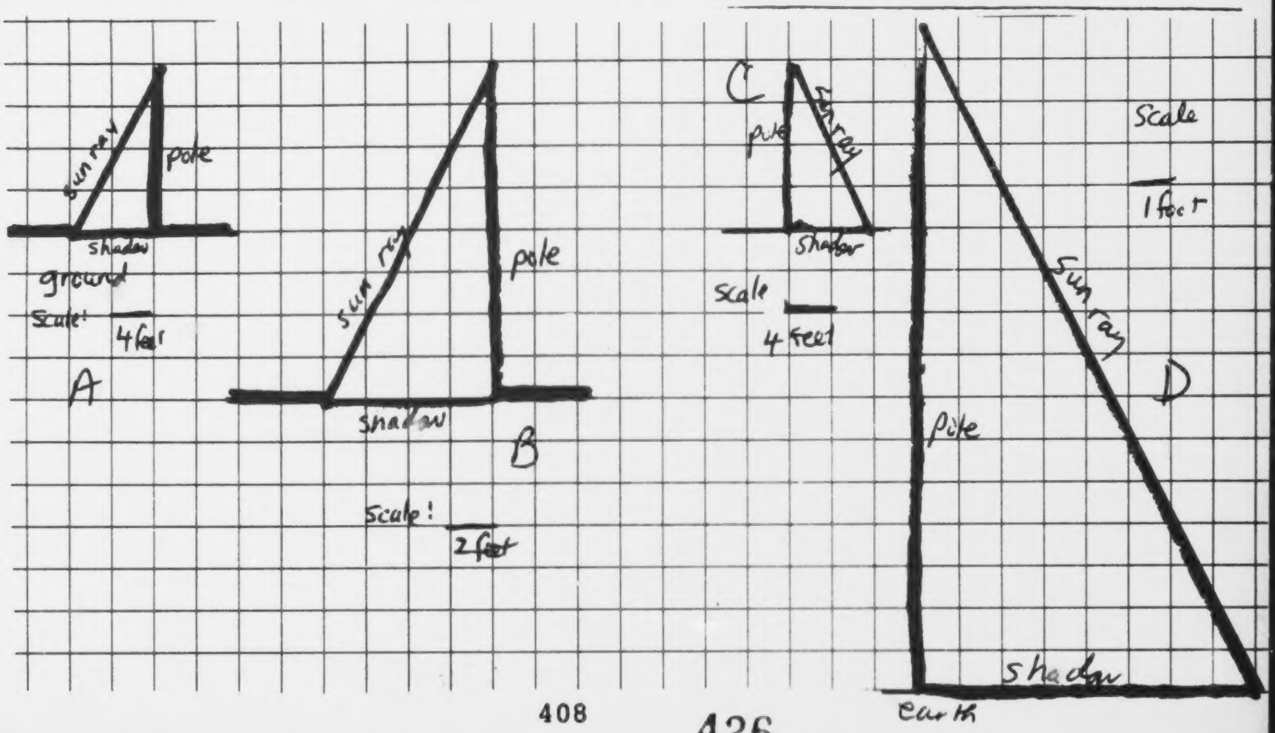
Note: A board graph chart is desirable for this lesson.

MOTIVATION:

At a certain time, a 16 foot flag pole casts an 8 foot shadow. Draw a scale diagram for this situation. (Use graph paper.)

DEVELOPMENT:

1. Have several students draw their diagrams at the board.


sun ray
pole
shadow
ground
Scale!
4 feet
A
sun ray
pole
shadow
B
Scale!
2 feet
C
pole
sun ray
shadow
Scale
4 feet
Scale
1 foot
sun ray
D
pole
shadow
earth

2. Ask, "When you used different scales, how did the diagrams change?"
   Elicit - the "corresponding" sides have different lengths.
   Using students' diagrams (or ones the teacher prompted) point out that if you double your scale, the sides will have lengths **HALF** the original lengths.

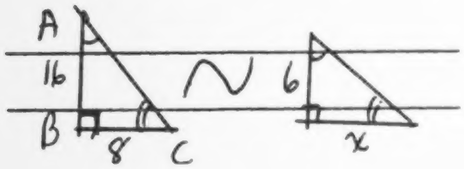
3. Ask, "When you used different scales did anything stay the same as in the original diagram?"
   Elicit "The angles remain the same". Demonstrate that in each diagram, the flagpole and the shadow form a right angle. Each triangle is a right triangle. Using an overhead projector, it is easy to show that other angles are congruent as well.

4. Note that all these triangles have the same "shape". Triangles that have the same shape are said to be "similar".

5. **IMPORTANT FACTS CONCERNING SIMILAR TRIANGLES.**
   a) Two triangles are similar if the angles of one of them are congruent to the angles of the other. [We write $\triangle ABC \sim \triangle DEF$.]
   b) When two triangles are similar, the ratios of corresponding sides will always be the same.

6. Do Applications 1(a) - 1(d).
   In 1(c) demonstrate the following "shortcut".
   IMPORTANT - If two angles of a triangle have the same measures as two angles of another triangle, then the triangles are similar.

7. In the shadow problem we started with, how long will a six foot man's shadow be? (Elicit 3 feet.)



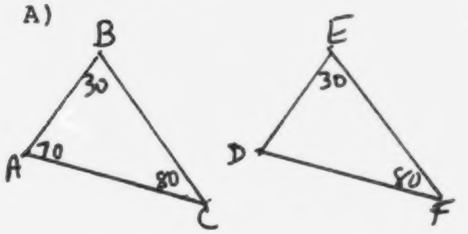
Set up the following equation with the class: $\frac{x}{6} = \frac{8}{16}$
$16x = 48$ so $x = 3$
(Define "proportion" as an equation in which both sides are fractions.)

8. Do Applications 2(a) - 2(d).

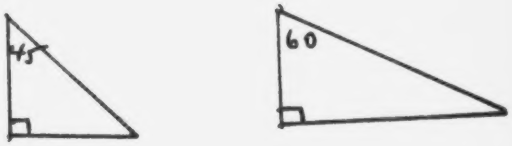
APPLICATIONS:

1. In each case determine whether or not the two triangles are similar.

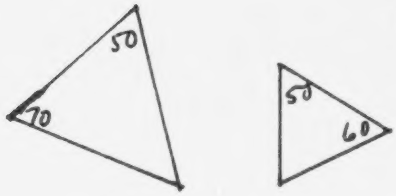
A)


B
30
A
70
80
C
E
30
D
80
F

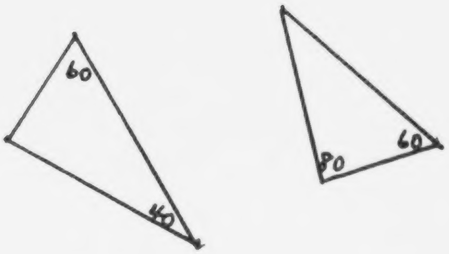
B)



C)

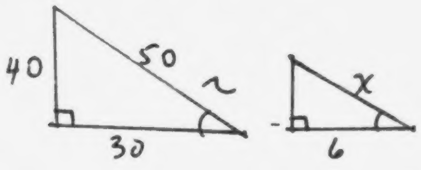


D)

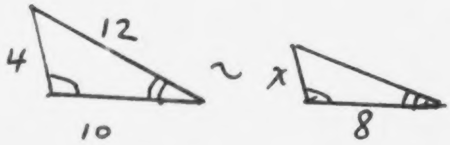


2. Find the missing lengths in each of the following pairs of similar triangles. (Note that the arcs are used to desiginate which angles are congruent.)

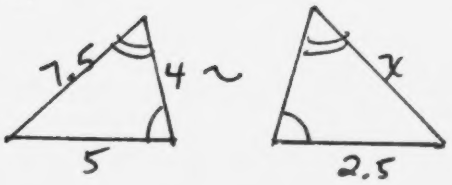
A)



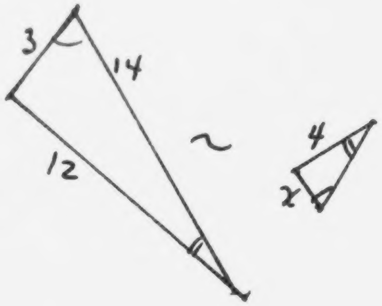
B)



C)



D)



SOLUTIONS TO APPLICATION PROBLEMS:

1. a) yes 1b) no 1c) yes 1d) yes

2. a) $\frac{x}{6} = \frac{50}{30} \rightarrow x = 10$

   b) $\frac{x}{8} = \frac{4}{10} \rightarrow x = 3.2$

   c) $\frac{x}{2.5} = \frac{7.5}{5} \rightarrow x = 3.75$

   d) $\frac{x}{4} = \frac{3}{12} \rightarrow x = 1$

SUMMARY:

Ask, "Of what value is it to know that two triangles are similar?"
Elicit - If two triangles are similar, we can find a missing length in one of them.

CONSUMER MATHEMATICS

INDIRECT MEASUREMENT AND TRIGONOMETRY

LESSON: 4

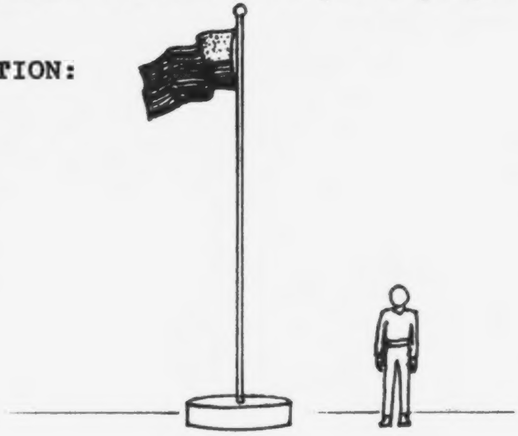
AIM: How do we use similar triangles to measure indirectly?

PERFORMANCE OBJECTIVES: The student will be able to...

1. Find the heights of objects using similar triangles and proportions.
2. Find the lengths of shadows given information leading to similar triangles.

VOCABULARY: similar triangles, proportion

MOTIVATION:



Suppose this man wanted to know the height of the flagpole; what information would help him find the height indirectly?

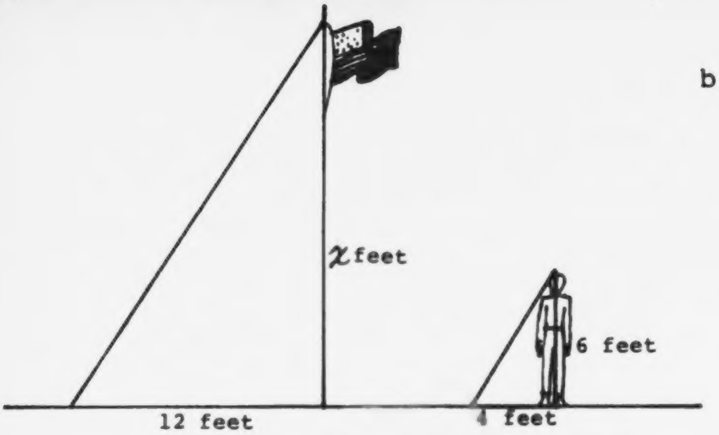
Elicit that the last lesson gives us some hints:

a) Measure the length of the shadow the pole casts.

b) Make measurements for another vertical object. For example, we can find how tall the man is and how long his shadow is (at the same time we measure the pole's shadow).

DEVELOPMENT:

1. In the above situation, suppose that the man is six feet tall, his shadow is four feet long and the pole's shadow is 12 feet long.
   a) Ask the class to draw (and label) a diagram for this situation.



b) Ask, "Is there any relationship between the two triangles?" Elicit they are similar since both the pole and person make right angles with the ground and the rays hit the ground at the same angle.

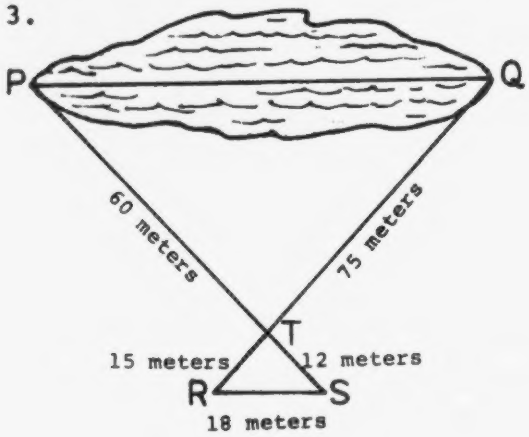
c) Ask, "What proportion can we write as a result of the triangles being similar?" Elicit: $\frac{x}{12} = \frac{6}{4}$ (or any equivalent). Also elicit the solution (x = 18 feet).

d) Ask, "Does this answer make sense?"

e) Check the answer in the equation.

2. Do Applications 1 and 2.

3.



A surveyor needs to know the width of the lake. In order to find it indirectly, he made measurements from a tree (T) as shown. How can we find the width of $\overline{PQ}$?

Note the that surveyor created triangle RTS to be **similar** to triangle QTP. This should be obvious since PT is 5 times as long as ST and QT is 5 times as long as RT. Thus PQ must be five times as long as RS, or 90 meters. If it is "not so obvious", we can make a proportion such as $\frac{15}{75} = \frac{18}{x} \rightarrow \frac{1}{5} = \frac{18}{x} \rightarrow x = 90$.

Ask, "What is wrong with using $\frac{12}{60} = \frac{18}{x}$?" (Nothing!)

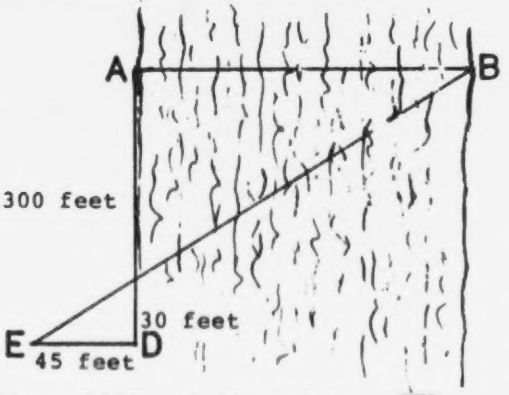
Ask, "What is wrong with using $\frac{15}{60} = \frac{18}{x}$?"

(Corresponding sides were not used on the left.)

4. Do Applications 3 and 4.

APPLICATIONS:

1. At the same time, a four feet pole casts a three foot shadow, a near by tree casts a 24 foot shadow. How tall is the tree?
2. A 20 foot telephone pole is in front of a tall building. If the pole casts a 16 foot shadow, how tall is the building if its shadow is 60 feet?
3.

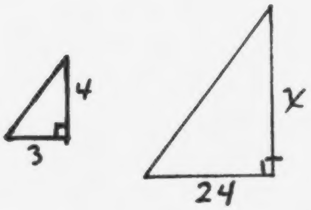


Find the width of the river ($\overline{AB}$).

4. A cliff near Roslyn's house is of unknown height. In order to calculate the height of the cliff she found a staff and placed it in the ground. This 4 foot staff had a 72 inch shadow. The cliff at the same time casts a 102 foot shadow. How high is the cliff?

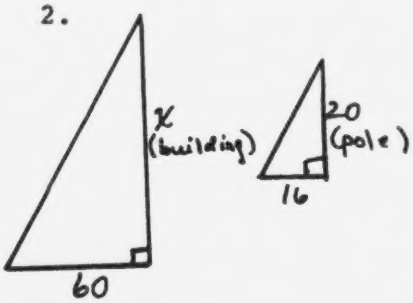
SOLUTIONS TO APPLICATION PROBLEMS:

1.



$\frac{x}{24} = \frac{4}{3} \Rightarrow 3x = 96 \Rightarrow x = 32$ feet

2.



$$\frac{x}{60} = \frac{20}{16}$$

$$16x = 1200$$

$$x = 75 \text{ feet}$$

3. $\frac{x}{300} = \frac{45}{30}$

$x = 450$ feet

4. $\frac{4}{6} = \frac{x}{102}$

$\frac{2}{3} = \frac{x}{102}$

$204 = 3x$ (Note 72 inches had to be changed to 6 feet since the limits must be consistent.)

$x = 68$ feet

SUMMARY:

Ask, "In what real life applications do we use similar triangles?"

Elicit - In finding "missing" heights, widths indirectly - these measurements would be quite complicated to find by other means.

CONSUMER MATHEMATICS
INDIRECT MEASUREMENT AND TRIGONOMETRY
LESSON: 5

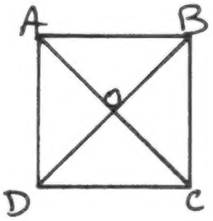
AIM: What are the parts of a right triangle?

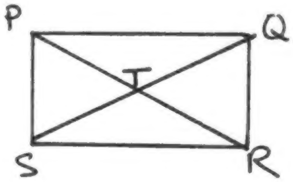
PERFORMANCE OBJECTIVES: The student will be able to...

1. Identify the legs and hypotenuse of a right triangle.
2. Identify the leg "opposite" a given acute angle of a right triangle.
3. Identify the leg "adjacent" to a given acute angle of a right triangle.
4. Fill in a chart giving all the above information for various triangles.

VOCABULARY: right triangle, hypotenuse, leg, adjacent leg, opposite leg

MOTIVATION:





Challenge: Name ALL the right triangles you see formed by this square and this rectangle.

Elicit: △ ADC, △ BCD, △ CBA, △ BAD
△ AOB, △ AOD, △ BOC, △ DOC
△ PQR, △ SPQ, △ QRS, △ PSR

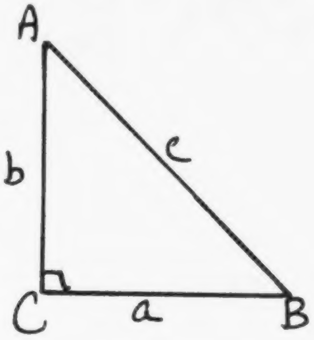
DEVELOPMENT:

1. Ask, "What do we mean when we say that a triangle is a right triangle". Elicit that a right triangle has an angle whose measure is 90. Ask, "Why are right angles so important? Elicit that they come up naturally since people, poles, etc. form right angles with the ground.

"Corners" or right angles in buildings, rooms, tables, etc. (Have class list other items in the room that contain right angles.)

2. Explain to the class that in the next few lessons the class must become "experts" on right triangles. Thus, we must be able to refer to the parts of a right triangle with ease.

3.



One Common Labelling for a Right Triangle

THE RIGHT TRIANGLE

A right triangle consists of

a) Three angles: Here ∢A, ∢B, ∢C (the right angle). (Traditionally, we often label the right angle as ∢C.)

b) Three sides: We use smaller letters to denote these. The longest (c) is called the **HYPOTENUSE** the other two sides are called the **LEGS**.

c) ∢C is composed of the two legs.

d) ∢B is composed of the hypotenuse c and leg a. Its leg (a) is called the **"ADJACENT LEG"** FOR ∢B. The leg (b) NOT used in making ∢B is called the **"OPPOSITE LEG"** for ∢B.

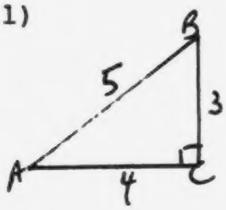
4. Ask the students to name the leg adjacent and the leg opposite to ∢A.

5. Do Applications 1, 2, 3 and 4.

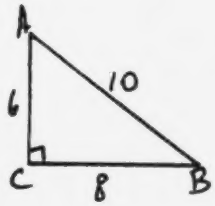
APPLICATIONS:

(1)-(4) In the given right triangles, fill in the lengths of the indicated sides.

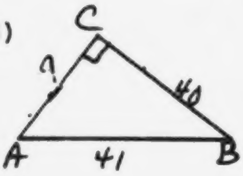
1)



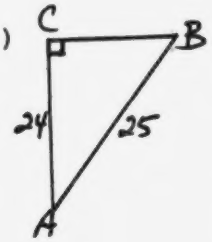
2)



3)



4)



	HYPOTENUSE	Length of Side Opposite ∡A	Length of Side Opposite ∡B	Length of Side Adjacent to ∡A	Length of Side Adjacent to ∡B
1)					
2)					
3)					
4)					

5. Which side is always the longest side of a right triangle?

6. Which angle always has the largest measure in a right triangle?

SOLUTIONS TO APPLICATION PROBLEMS:

	HYPOTENUSE	Length of Side Opposite ∡A	Length of Side Opposite ∡B	Length of Side Adjacent to ∡A	Length of Side Adjacent to ∡B
1)	5	3	4	4	3
2)	10	8	6	6	8
3)	41	40	9	9	40
4)	25	7	24	24	7

5. The hypotenuse.

6. The right angle.

SUMMARY:

Ask, "How do we know which leg is adjacent to a given angle in a right triangle?"
Elicit "It is the leg that is used to make the given angle."

CONSUMER MATHEMATICS

INDIRECT MEASUREMENT AND TRIGONOMETRY

LESSON: 6

AIM: What is the tangent ratio and how do we use a trigonometic table fo find the tangent of a given angle?

PERFORMANCE OBJECTIVES: The student will be able to...

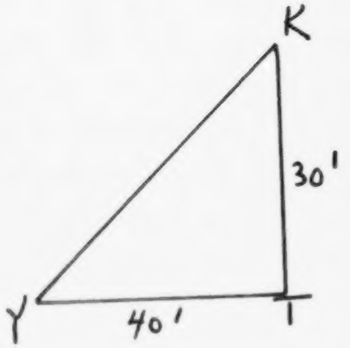
1. Use a protractor to find the measure of a given angle.
2. Find the tangent of a given angle by measuring lengths of sides and dividing.
3. Develop a mini-table of tangents of angles.
4. Use a trigonometic table to find the tangent of a given angle.

VOCABULARY: tangent of an angle, trigonometry

MOTIVATION:

1. Draw a scale drawing for the following problem using the scale assigned to your row:
   A kite is flown so that it is 30 feet above the ground over a tree 40 feet away from the youngster holding the string.
   Group 1: Use 1" to represent 10 feet.
   Group 2: Use $\frac{1}{2}$" to represent 10 feet.
   Group 3: Use 1" to represent 5 feet.

2. After class has finished ask students:
   a) "What is the measure of ∡T?" (90)
   b) "What is the measure of YK? (50)
   Hold up one students work for the class to see. Ask, "How many of you obtained a triangle CONGRUENT to this one?" (Only that student's group should have hands raised.) Ask, "How many of you obtained a triangle SIMILAR to this one?" (Everyone should raise hands!)



DEVELOPMENT:

1. Distribute protractors. Tell the class that it may be useful to double check by measuring the remaining angles. Time may be needed to teach the class to use the protractors.
   Elicit that m ∡Y 37 and m ∡K 53.

2. Today we are going to learn another method to find the measure of an angle of a RIGHT triangle using **TRIGONOMETRY**.

3. In trigonometry we consider
   a) an ANGLE of a RIGHT triangle and b) the ratio of the lengths of two sides of the triangle.
   NOTE: All triangles with angles measuring 37-53-90 are similar. Thus certain ratios will not change.
   One such ratio is the **"TANGENT RATIO"**.

4. To get the tangent of an angle we use the ratio:

   $$\textbf{TANGENT OF AN ANGLE} = \frac{\textbf{length of the OPPOSITE leg}}{\textbf{length of the ADJACENT leg}}$$

   Note that in our example $\tan Y = \frac{\text{opp leg}}{\text{adj leg}} = \frac{30}{40} = \frac{3}{4} = .75$

   $$\tan K = \frac{\text{opp leg}}{\text{adj leg}} = \frac{40}{30} = \frac{4}{3} = 1.3333$$

5. Do Applications 1-4. Round answers to four decimal places.

6. Tell students that trigonometric tables have been developed to help us with this work. The tangents of angles from 1° to 89° have been calculated to four decimal places. One such table follows here. Distribute tables and have students use them to find:
   a) tan 30° (.5774) b) tan 20° (.3640) c) tan 72° (3.0777)

7. In our first problem note that tan Y = .75. By using the table, we find that the angle whose tangent is closest to .75 is 37°.

8. Do Applications 5-8. Find the NEAREST ANGLE!

THE UNIVERSITY OF THE STATE OF NEW YORK

THE STATE EDUCATION DEPARTMENT

DIVISION OF EDUCATIONAL TESTING

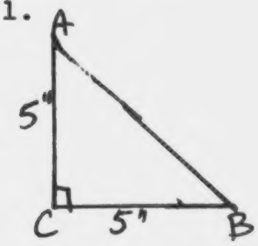
Tables of Natural Trigonometric Functions

Angle	Sine	Cosine	Tangent	Angle	Sine	Cosine	Tangent
1°	.0175	.9998	.0175	46°	.7193	.6947	1.0355
2°	.0349	.9994	.0349	47°	.7314	.6820	1.0724
3°	.0523	.9986	.0524	48°	.7431	.6691	1.1106
4°	.0698	.9976	.0699	49°	.7547	.6561	1.1504
5°	.0872	.9962	.0875	50°	.7660	.6428	1.1918
6°	.1045	.9945	.1051	51°	.7771	.6293	1.2349
7°	.1219	.9925	.1228	52°	.7880	.6157	1.2799
8°	.1392	.9903	.1405	53°	.7986	.6018	1.3270
9°	.1564	.9877	.1584	54°	.8090	.5878	1.3764
10°	.1736	.9848	.1763	55°	.8192	.5736	1.4281
11°	.1908	.9816	.1944	56°	.8290	.5592	1.4826
12°	.2079	.9781	.2126	57°	.8387	.5446	1.5399
13°	.2250	.9744	.2309	58°	.8480	.5299	1.6003
14°	.2419	.9703	.2493	59°	.8572	.5150	1.6643
15°	.2588	.9659	.2679	60°	.8660	.5000	1.7321
16°	.2756	.9613	.2867	61°	.8746	.4848	1.8040
17°	.2924	.9563	.3057	62°	.8829	.4695	1.8807
18°	.3090	.9511	.3249	63°	.8910	.4540	1.9626
19°	.3256	.9455	.3443	64°	.8988	.4384	2.0503
20°	.3420	.9397	.3640	65°	.9063	.4226	2.1445
21°	.3584	.9336	.3839	66°	.9135	.4067	2.2460
22°	.3746	.9272	.4040	67°	.9205	.3907	2.3559
23°	.3907	.9205	.4245	68°	.9272	.3746	2.4751
24°	.4067	.9135	.4452	69°	.9336	.3584	2.6051
25°	.4226	.9063	.4663	70°	.9397	.3420	2.7475
26°	.4384	.8988	.4877	71°	.9455	.3256	2.9042
27°	.4540	.8910	.5095	72°	.9511	.3090	3.0777
28°	.4695	.8829	.5317	73°	.9563	.2924	3.2709
29°	.4848	.8746	.5543	74°	.9613	.2756	3.4874
30°	.5000	.8660	.5774	75°	.9659	.2588	3.7321
31°	.5150	.8572	.6009	76°	.9703	.2419	4.0108
32°	.5299	.8480	.6249	77°	.9744	.2250	4.3315
33°	.5446	.8387	.6494	78°	.9781	.2079	4.7046
34°	.5592	.8290	.6745	79°	.9816	.1908	5.1446
35°	.5736	.8192	.7002	80°	.9848	.1736	5.6713
36°	.5878	.8090	.7265	81°	.9877	.1564	6.3138
37°	.6018	.7986	.7536	82°	.9903	.1392	7.1154
38°	.6157	.7880	.7813	83°	.9925	.1219	8.1443
39°	.6293	.7771	.8098	84°	.9945	.1045	9.5144
40°	.6428	.7660	.8391	85°	.9962	.0872	11.4301
41°	.6561	.7547	.8693	86°	.9976	.0698	14.3007
42°	.6691	.7431	.9004	87°	.9986	.0523	19.0811
43°	.6820	.7314	.9325	88°	.9994	.0349	28.6363
44°	.6947	.7193	.9657	89°	.9998	.0175	57.2900
45°	.7071	.7071	1.0000	90°	1.0000	.0000	

APPLICATIONS:

Find the tangent ratios in each case:

1.



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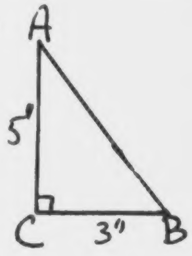

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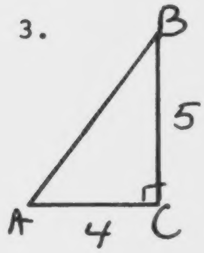
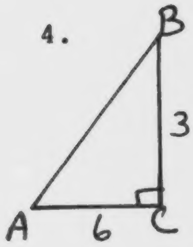


4.



tan A = ?	tan A = ?	tan A = ?	tan A = ?
tan B = ?	tan B = ?	tan B = ?	tan B = ?

5. Find m ∡A in ex 1 using your trigonometric table.

6. Find m ∡A in ex 2 using your trigonometric table.

7. Find m ∡A in ex 3 using your trigonometric table.

8. Find m ∡A in ex 4 using your trigonometric table.

SOLUTIONS TO APPLICATION PROBLEMS:

1. tan A = 1.0000
   tan B = 1.0000

2. tan A = $\frac{3}{5}$ = .6
   tan B = $\frac{5}{3}$ = 1.6667

3. tan A = $\frac{5}{4}$ = 1.25
   tan B = $\frac{4}{5}$ = .8

4. tan A = $\frac{3}{6}$ = .5
   tan B = $\frac{6}{3}$ = 2.0

5. 45°

6. 31°

7. 51°

8. 27°

SUMMARY:

Ask, "How can we avoid using protractors if we know a little trigonometry?"

CONSUMER MATHEMATICS
INDIRECT MEASUREMENT AND TRIGONOMETRY
LESSON: 7

AIM: How do we use the tangent ratio to calculate lengths indirectly?

PERFORMANCE OBJECTIVES: The student will be able to...

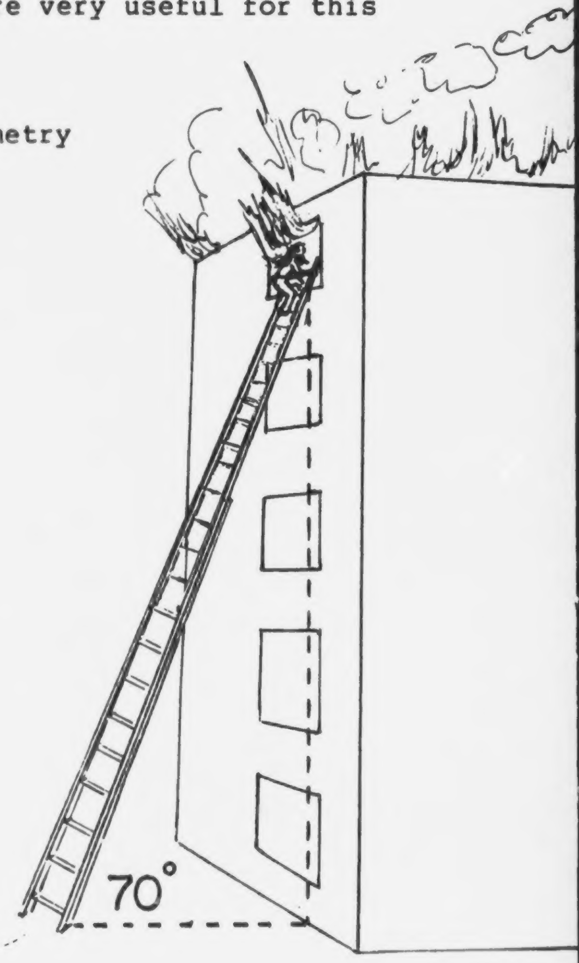
1. Find a missing length of a right triangle using the tangent ratio.
2. Find a height, width, etc from a "real life" problem indirectly, using the tangent ratio.

Note: Calculators, if available, are very useful for this lesson.

VOCABULARY: tangent of an angle, trigonometry

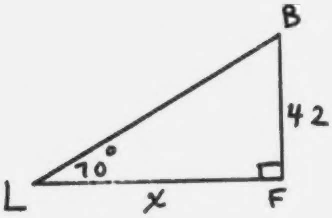
MOTIVATION:

The building in this diagram is on fire. Poor Brooke is on the fifth floor 42 feet above the ground. If the safest angle for a ladder has a measure of 70°, how far should the ladder be placed from the foot (base) of the building (to the nearest foot) in order that Brooke be saved?



DEVELOPMENT:

1. When we simplify the diagram for this problem, we obtain:



Ask, "What type of angle is angle F? Why?"

2. **IF CALCULATORS ARE AVAILABLE**	**IF CALCULATORS ARE NOT AVAILABLE**
Elicit that tan 70 = $\frac{42}{x}$	Elicit that tan 70° = $\frac{42}{x}$
$2.7474774 = \frac{42}{x}$	$2.7475\ x = 42$
(Place tan 70 in Memory.)	Elicit this is too messy.
$2.7474774x = 42$	Use m ∡B = 20
$x = \frac{42}{2.7474774x}$ (42÷MR) =	$\tan 20 = \frac{x}{42}$
$x = 15.28675$ Answer 15 feet	$.3640 = \frac{x}{42}$
	$x = 42(.3640)$
	$x = 15.288$ Answer 15 feet

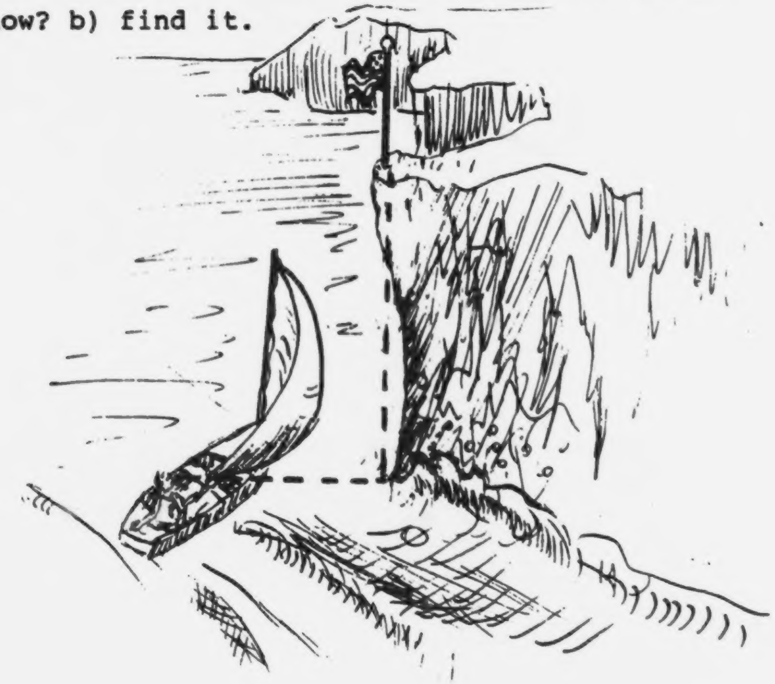
3. Tell the class that many problems that arise in daily life can be solved using trigonometry.
   If a diagram for the situation involves
   a) a right triangle
   b) the two legs of the triangle and an angle
   then the tangent ratio can help us solve the problem.

4. Do Applications 1-3.
   Be sure in each example to stress that we:
   a) First draw a diagram.
   b) If the diagram involves a right triangle, two legs and an angle, then we use the tangent ratio.
   c) Ask - Does the answer make sense?

APPLICATIONS:

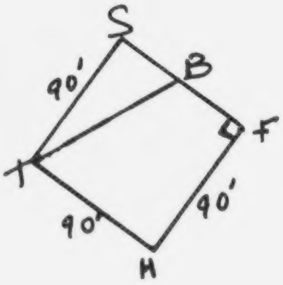
1. Allan is flying a kite! If the kite is directly above a point 150 feet away from Allan, and the string makes an angle of 40° with the ground, a) what quantity may we wish to know? b) find it.

2.



Carol is out in her sailboat and sites a flagpole atop a cliff. If the flagpole is 250 meters above sea level and Carol's line of vision makes a 64° angle with the horizontal, how far is Carol's sailboat from the foot of the cliff?

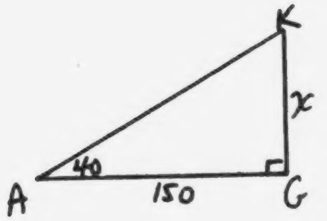
3.



A baseball diamond is a square whose side has length 90 feet (see diagram). If the Third baseman throws a ball to the first baseman (who is chasing a runner) so that the path of the ball forms a 40° angle with $\overline{TS}$, how far from first base will the ball be caught?

SOLUTIONS TO APPLICATION PROBLEMS:

1.



a) How high is the kite (later we will also be able to find how many feet of string have been let out).

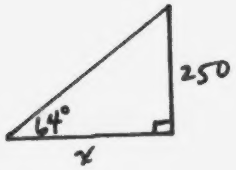
b) $\tan 40 = \frac{x}{150}$

$x = 150(.8290996)$ $x = 150(.8391)$

$x = 125.86494$ (calculator) $x = 125.865$ (by hand)

Answer: The kite is approximately 126 feet above the ground. (This answer is reasonable.)

2.



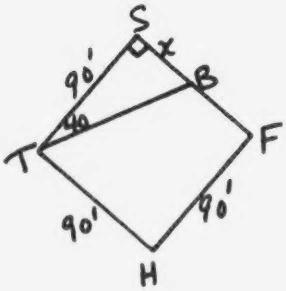
$\tan 64 = \frac{250}{x}$ or $\tan 26 = \frac{x}{250}$

$x = 250\ (.4877325) = 121.93315$ (calculator)

or $x = 250\ (.4877) = 121.925$ (by hand)

Answer: The sailboat is 122 feet from the feet of the difference. (This also makes sense!)

3.



$\tan 40 = \frac{x}{90}$

$x = 90 \tan 40 = 90(.8390996) = 75.518967$

(by calculator)

$= 90(.8391) = 75.519$

(by hand)

This gives the distance to second! Elicit that the distance to first is approximately 145 feet.

SUMMARY:

Ask, "Under what circumstances do we use trigonometry to solve a problem?"

CONSUMER MATHEMATICS

INDIRECT MEASUREMENT AND TRIGONOMETRY

LESSON: 8

AIM: How do we use the tangent ratio in a verbal problem requiring us to calculate lengths indirectly?

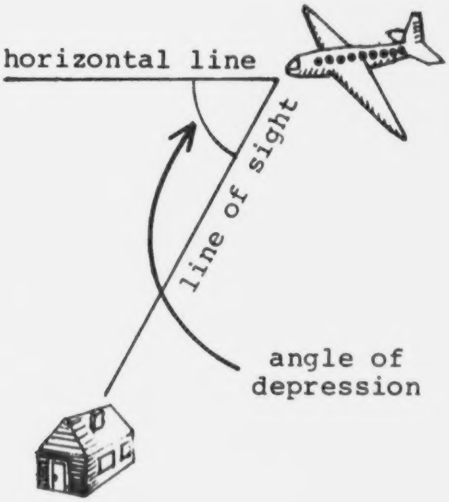
PERFORMANCE OBJECTIVES: The student will be able to...

1. Define the angle of elevation and the angle of depression.
2. Use the tangent ratio in a word problem to find a missing length (rounded).

Note: Calculators, if available, are very useful for this lesson.

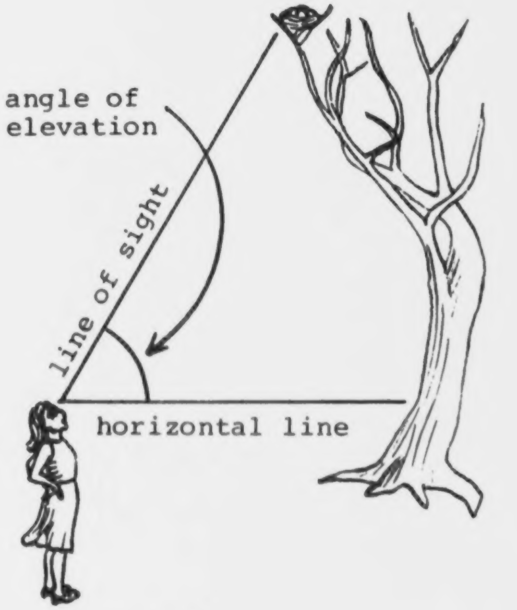
VOCABULARY: angle of elevation, angle of depression

MOTIVATION:



horizontal line
line of sight
angle of depression

SITUATION (A)



angle of elevation
line of sight
horizontal line

SITUATION (B)

In order to make indirect measurements we often use ANGLES. TWO common situations are shown in the diagram. In both cases, a person is looking at an object (pilot observing building in (A); a person looking at the top of the tree in (B)). We will focus on the angle formed by **the line of sight and the horizontal line coming from the viewer's eyes.**

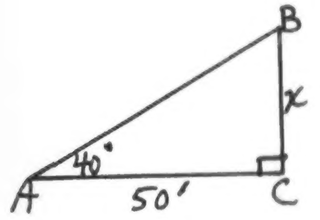
DEVELOPMENT:

1. Write on the board: When an observer must look up to see the object, we call the angle formed, **the ANGLE of ELEVATION.** When the observer must look down to see the object, we call the angle formed, **the ANGLE of DEPRESSION.**

2. Set up the following problem with your class:

   At a point 50 yards away from the foot of a tree someone measures the angle of elevation of the top of the tree to be 40°. Find, to the nearest foot, the height of the tree.

   Elicit that the diagram for situation (B) will suffice.

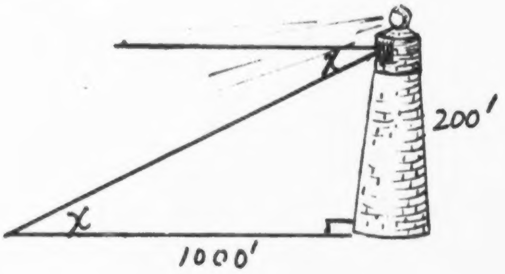
   Ask, "Why is the triangle for this problem a right triangle?"
   Ask, "Why can we use trigonometry to solve this problem?" (Elicit that we have a right triangle involving an angle and its two legs.) Set up: $\tan 40 = \frac{x}{50}$

   $x = 50(.8391) = 41.955$. Thus our answer is: The tree is 42 feet tall. Ask, "Does this answer make sense?"

3. Have your class set up the following problem:

   Find to the nearest degree the measure of the angle of depression from the top of a lighthouse 200 feet tall when a boat is observed 1000 feet away.

   a) Develop the diagram.
   b) Elicit that the angle of depression and the corresponding angle of elevation are congruent.
   c) $\tan x = \frac{200}{1000} = .2$

   Using the trig table, m∢x = 11.

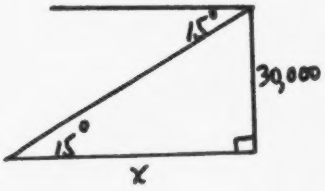
4. Do Applications 1-3.
   Make sure that the students check that their answers are reasonable.

APPLICATIONS:

1. The angle of depression from a plane to an object is 15°. The plane is 30000 feet above the ground. How far to the nearest ten feet is the object from the point directly below the plane?
2. What is the measure of the angle of elevation of the sun when a 6 foot person has a 12 foot shadow?
3. Find to the nearest foot the height of a building if its shadow is 50 feet long when the angle of elevation of the sun is 62°.

SOLUTIONS TO APPLICATION PROBLEMS:

1.



If calculators are used.

$\tan 15 = \frac{30000}{x}$

$(.2679491)x = 30000$

$x = 111961.52$

Answer: 111,960 feet

If not using calculators.

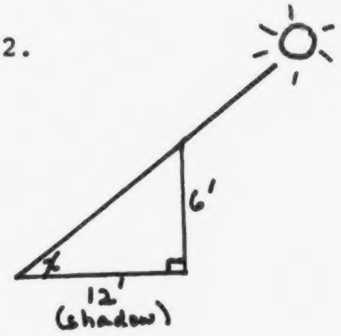
use $\tan 75 = \frac{x}{3000}$

$x = 30000(3.7321)$

$x = 111963$

Answer: 111,960 feet

2.



$\tan x = \frac{6}{12} = .5$

$x = 27°$

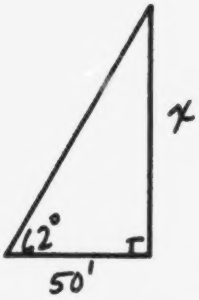
(Show, using yellow chalk, how shadows are created. Also be sure that students understand the meaning of the "angle of elevation of the sun".)

3. $\tan 62 = \frac{x}{50}$

$x = 50(1.8807265)$

$x = 94.036325$

Answer 94 feet



SUMMARY:

Ask, "Suppose we wanted to measure the height of our school building. What measurements could we make directly so that using trigonometry, we can find the height we want?"

CONSUMER MATHEMATICS
INDIRECT MEASUREMENT AND TRIGONOMETRY
LESSON: 9

AIM: What is the Pythagorean Theorem and how do we use it to measure lengths indirectly?

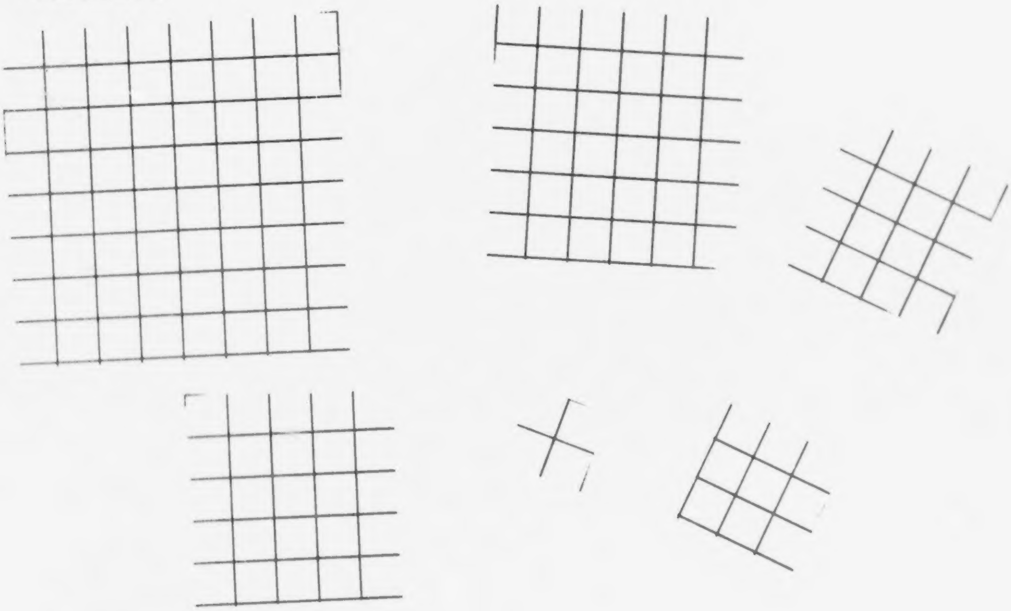
PERFORMANCE OBJECTIVES: The student will be able to...

1. State the Pythagorean Theorem.
2. Use the Pythagorean Theorem to find a missing length in a right triangle.

VOCABULARY: Pythagorean Theorem, right triangle, hypotenuse, leg

MOTIVATION:

Distribute a packet of squares (cut from grid paper) to each student.



(Squares with sides having these lengths should be enclosed.)

Have students a) find the area of each square b) choose any three and try to form a triangle using the edges of the squares as sides for the triangle.

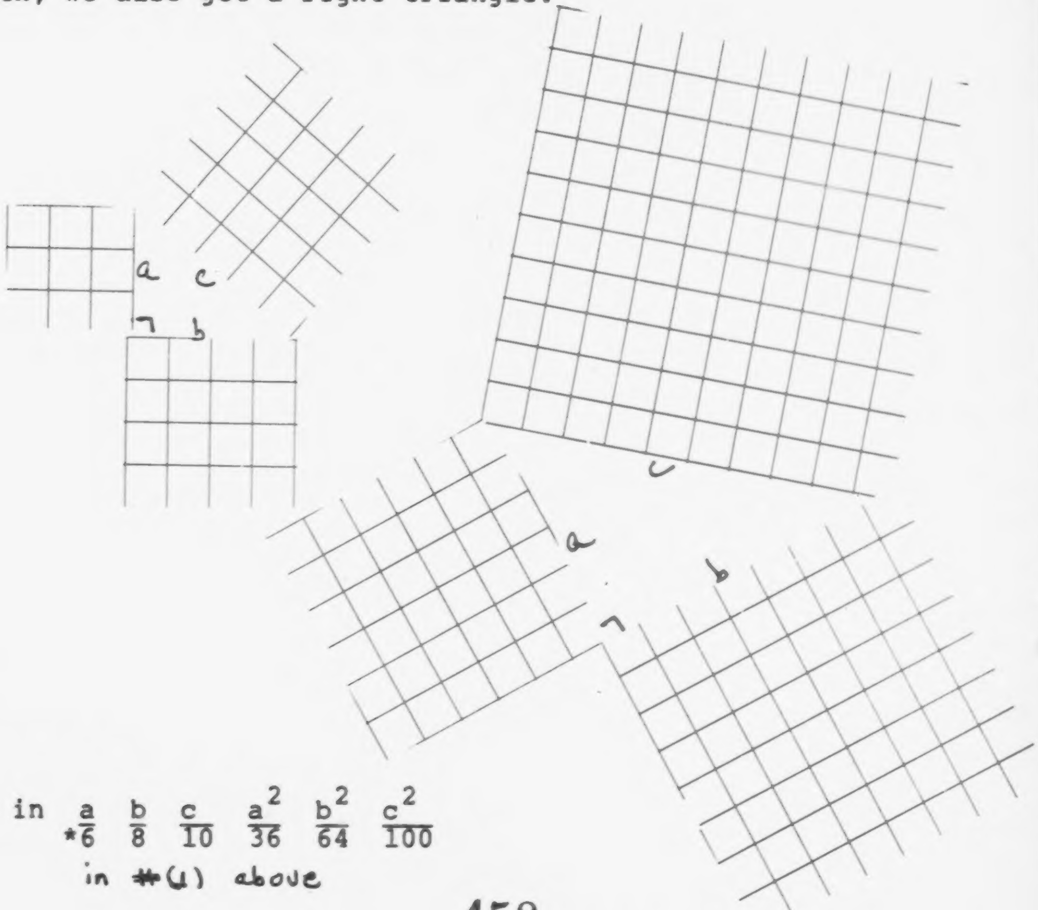
DEVELOPMENT:

1. Form a chart with lengths giving triangles. Let a,b,c be the lengths of the sides with c being the largest side. Fill in with values elicited from students.

a	b	c	Area of square with side a	Area of square with side b	Area of square with side c
2	3	4	4	9	16
3	4	6	9	16	36
4	5	6	16	25	36
*3	4	5	9	16	25
4	5	8	16	25	64
4	6	8	16	36	64

   Ask, "Did anybody get a right triangle?" (Put an asterisk next to entry 3,4,5.)

2. Distribute some 10x10 squares and see if students can get another RIGHT triangle.
   Elicit that using squares with sides 6, 8 and 10 boxes in length, we also get a right triangle.



Fill in

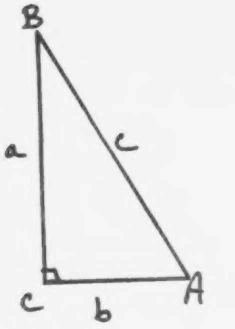
a	b	c	a^2	b^2	c^2
*6	8	10	36	64	100

in #(1) above

3. The teacher may wish to prepare a few other cases in advance so students can have more data in which we have right triangles. Use sides with lengths (5,12,13), (9,12,15), etc.

4. Ask, "Today we are interested in the relationship among the squares we used when a RIGHT angle was formed. Can you look at the chart we developed to get such a relationship. (Elicit that $a^2+b^2 = c^2$ where c is the hypotenuse.)

5. Tell the students that this rule is called the "Pythagorean Theorem" or "Pythagorean Rule". It is named after the Greek mathematician Pythagoras who is credited with its proof in the sixth century BC. Write on the BOARD.



THE PYTHAGOREAN THEOREM

$a^2+b^2=c^2$, where c is the hypotenuse

- or -

In a right triangle, the sum of the SQUARES of the lengths of the legs is equal to the square of the length of the hypotenuse.

6. Do Applications 1-5.

7. Do Applications 6-7
In example 7 introduce the symbol $\sqrt{\ }$ for the square root. We write $\sqrt{21}$ (this is approximately 4.6). If calculators are available, let students find the square root.

APPLICATIONS:

In each case tell whether or not the given lengths will form a RIGHT triangle.

1. 5, 12, 13

2. 9, 10, 12

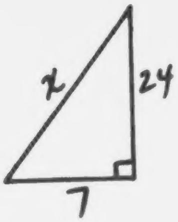
3. 9, 12, 15

4. 9, 14, 18

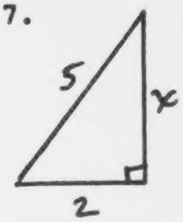
5. 9, 40, 41

Find the missing length in the given right triangle.

6.



7.



SOLUTIONS TO APPLICATION PROBLEMS:

1. $(5)^2+(12)^2 \stackrel{?}{=} (13)^2$
   $25+144 = 169$
   Yes

2. $(9)^2+(10)^2 \stackrel{?}{=} (12)^2$
   $81+100 \neq 144$
   No

3. $(9)^2+(12)^2 \stackrel{?}{=} (15)^2$
   $81+144 = 225$
   Yes

4. $(9)^2+(14)^2 \stackrel{?}{=} (18)^2$
   $81+196 \stackrel{?}{=} 324$
   $277 \neq 324$
   No

5. $(9)^2+(40)^2 \stackrel{?}{=} (41)^2$
   $81+1600 = 1681$
   Yes

6. $x^2 = (7)^2 + (24)^2$

$x^2 = 49+576$

$x^2 = 625$

$x = 25$

7. $x^2+2(2) = (5)^2$

$x^2+4 = 25$

$x^2 = 21$

$x = \sqrt{21}$

SUMMARY:

Ask, "Under what circumstances can we use the Pythagorean Theorem". (Elicit that we must have a right triangle. The problem must involve all three sides.)

CONSUMER MATHEMATICS
INDIRECT MEASUREMENT AND TRIGONOMETRY
LESSON: 10

AIM: How do we use the Pythagorean Theorem to find a missing length (indirectly) in a word problem?

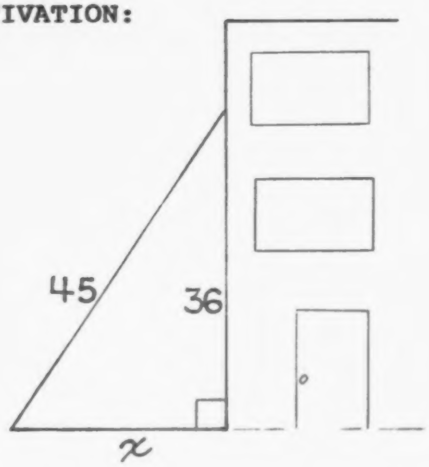
PERFORMANCE OBJECTIVES: The student will be able to...

1. Use the Pythagorean Theorem to find a missing length described in a word problem.

   (Note: Calculators, if available are very useful for this lesson.)

VOCABULARY: Pythagorean Theorem, legs, hypotenuse, "due north", "due east", etc

MOTIVATION:



A ladder 45 feet long is placed against a building 36 feet above the ground. How far is the foot of the ladder from the building?

DEVELOPMENT:

1. Say, "So far we studied two methods of working with right triangles:
   a) trigonometry
   b) Pythagorean Theorem."
   Ask, "How can we tell which method must be used here?" Elicit that for trigonometry to be used, we would need the measure of one of the acute angles of this triangle. Since all three sides of the triangle are involved here, we use the Pythagorean Theorem.

Elicit that

$$\begin{aligned} x^2+(36)^2 &= (45)^2 \\ x^2+1296 &= 2025 \\ x^2 &= 729 \\ x &= \sqrt{729} = 27 \end{aligned}$$

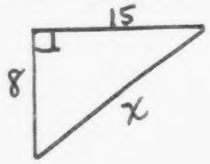
2. Do Application 1. Elicit that we need a good diagram in order to understand the problem.
3. Do Applications 2 and 3. In Application 3, show that in order to avoid very large numbers we can use similar triangles. Also review the tangent ratio.
4. Do Applications 4 and 5.

APPLICATIONS:

1. A plane flew due north 8 miles and then 15 miles due east. How far was it from the starting point?
2. Can an umbrella 22 inches long fit into a suitcase whose dimensions are 12 inches by 16 inches.
3. A boy let out 600 inches of string when he flew his kite. The distance from the child to a point directly below the kite is 360 inches. a) If the boy is 4 feet tall, how high is the kite? b) What is the number of degrees in the boy's angle of elevation of the kite to the nearest degree?
4. What is the shortest distance from first base to third base? (The baseball diamond is a square, 90 feet on a side.)
5. How long is the diagonal of a rectangle whose dimensions are 60" x 11"?

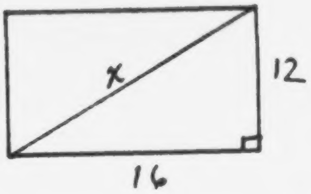
SOLUTIONS TO APPLICATION PROBLEMS:

1.



$$\begin{aligned} (8)^2+(15)^2 &= x^2 \\ 64+225 &= x^2 \\ x^2 &= 289 \\ x &= 289 = 17 \end{aligned}$$

2.



$x^2 = 16^2+12^2$

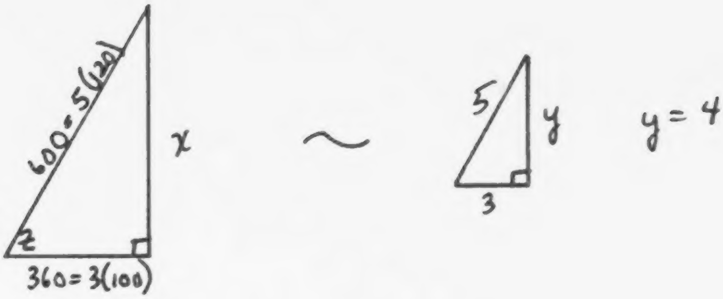
$x^2 = 256+144$

$x^2 = 400$

$x = \sqrt{400} = 20$

The largest unbrella would fit along the diagonal which is 20 inches long. Thus, a 22 inch umbrella is too long.

3.

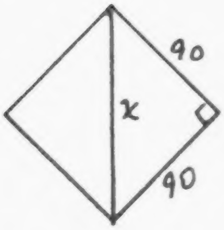


a) Thus x = (120) = 480 inches. Add on the height of the youngster, get 480+48 = 528 inches.

b) $\tan z = \frac{480}{360} = 1.3333$

$z = 53°$

4.



$x^2 = (90)^2+(90)^2$

$x^2 = 16200$

$x = \sqrt{16200}$

x is approximately 127.3 feet.

5. $x^2 = (60)^2+(11)^2$

$= 3600+121$

$x^2 = 3721$

$x = 61$

Answer 61 inches.

SUMMARY:

Ask, "When a word problem involves lengths, what should you do to start the problem?" (Draw a diagram.)

Ask, "How do you know when to use the Pythagorean Theorem in a problem?" (Elicit you should be given a right triangle and all three lengths of sides should be involved.)

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